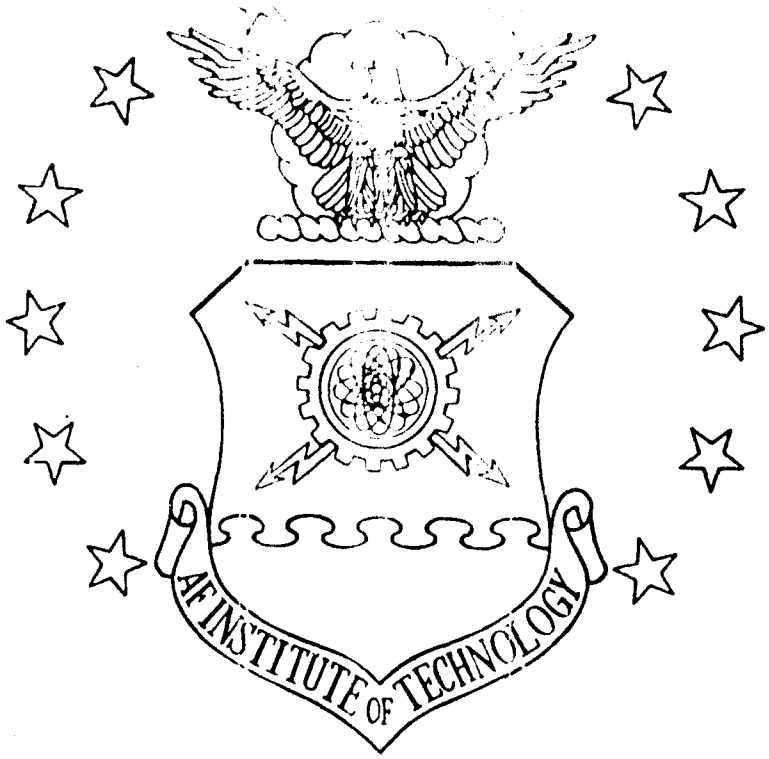


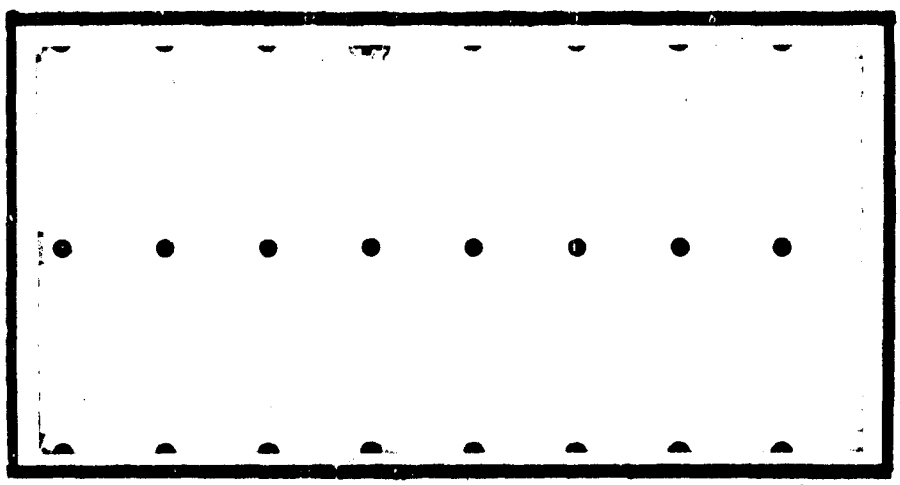



DEPARTMENT OF THE AIR FORCE

AIR UNIVERSITY

# AIR FORCE INSTITUTE OF TECHNOLOGY

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AFIT/GEM/LSR/88S-13

# A MANAGEMENT INFORMATION SYSTEM FOR BARE BASE CIVIL ENGINEERING COMMANDERS

THESIS

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AFIT/GEM/LSR/88S-13



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# A MANAGEMENT INFORMATION SYSTEM FOR BARE BASE CIVIL ENGINEERING COMMANDERS

THESIS

Presented to the Faculty of the School of Systems and Logistics
of the Air Force Institute of Technology
Air University
In Partial Fulfillment of the
Requirements for the Degree of
Master of Science in Engineering Management

Mark A. Pohlmeier, B.S.
Captain, USAF

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## Preface

The task of developing an automated contingency management information system (MIS) can not be accomplished alone. It requires inputs from a broad spectrum of specialists. I would like to thank those who helped bring this program to fruition.

The requirement of identifying the general categories of information needed by field CE commanders while bedding down a bare base was at the heart of this research. I received invaluable assistance in identifying and prioritizing these categories from the MAJCOM planners and CE commanders of past bare base exercises identified in this report. A special thanks goes out to these individuals for their efforts and commitment to this research.

The decision of which software to use in automating this MIS was vital to its successful completion. I would like to thank all of the faculty members of the School of Systems and Logistics who gave me advice on the capabilities and limitations of the alternative software package.

Once a MIS is developed, it is important to ensure it operates effectively under field conditions. I sincerely appreciate all those who took time out of their busy schedules to field test this system and comment on its operational capabilities.

I wish to extend my deepest gratitude to Dr. Charles Fenno who was a true partner in this research and deserves an equal share in its credit. Besides helping me identify this topic and providing a source of motivation, he was always asking "What can I do for you?". I take great pride in this thesis primarily because I know that it stands up to Dr. Fenno's high standards.

Finally, I would like to thank Captain Crystal D. Blalock for being a great source of support throughout this adventure. She was my crutch, sounding board, editor, critic, colleague, and most of all friend. I will always look back on my AFIT experience with fond memories because of the special people I met like Crystal and Dr. Fenno.

Copies of the BBMIS program have been left at AFIT's School of Systems and Logistics library and with Dr. Fenno. A list of acronyms has been provided in the prefatory portion of this report for the reader's convenience.

Mark A. Pohlmeier

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## List of Acronyms

| | |
|---|---|
| AF | Air Force |
| AFB | Air Force Base |
| AFCE | Air Force Civil Engineering |
| AFESC | Air Force Engineering and Services Center |
| AFIT | Air Force Institute of Technology |
| AFLMC | Air Force Logistics Maintenance Center |
| AFM | Air Force Manual |
| AFR | Air Force Regulation |
| AFS | Air Force Station |
| BBMIS | Bare Base Management Information System |
| BCE | Base Civil Engineering or Base Civil Engineer |
| BEEF | Base Engineering Emergency Force |
| CE | Civil Engineering |
| CENTAF | Central Air Force |
| CESPG | Civil Engineering Support Plan Generator |
| COB | Collocated Operating Base |
| CPM | Critical Path Method |
| CS | Combat Support |
| DBMS | Database Management System |
| DoD | Department of Defense |
| FOL | Forward Operating Location |
| HEIMS | Harvest Eagle Inventory Management System |
| IC-HAMS | Integrated Combat-Harvest Assets Management System |
| LCD | Liquid Crystal Display |

| | |
|---|---|
| MAJCOM | Major Command |
| MIS | Management Information System |
| MS-DOS | Microsoft Disk Operating System |
| NSN | National Stock Number |
| O&M | Operations and Maintenance |
| PC | Personal Computer |
| PERT | Program Evaluation and Review Technique |
| RAM | Random Access Memory |
| SAC | Strategic Air Command |
| SIN | Abbreviated Stock Number |
| SWA | Southwest Asia |
| TAC | Tactical Air Command |
| TPFDL | Time-Phased Force and Deployment List |
| USAFE | United States Air Force Europe |
| UTC | Unit Type Code |
| WDR | War Damage Repair |
| WIMS | Work Information Management System |
| WRM | War Reserve Materiel |
| WW II | World War II |

## Abstract

The bare base deployment scenario contains some of the most challenging tasks facing Air Force Civil Engineering today--yet the essential information needed to accomplish this mission is difficult or impossible to manage efficiently during the limited time between notification and the end of the initial beddown stage. The purpose of this research was to determine the feasibility of developing a microcomputer based management information system (MIS) designed for use by the Civil Engineering (CE) commander during the initial stages of a bare base scenario.

Nineteen categories of unclassified information needed by the bare base CE commander were identified from governing regulations, exercise documents, and interviews with CE commanders and MAJCOM planners of past bare base exercises. These categories were evaluated against automation constraints (both hardware and software) to select the software best suited to synthesize four of the categories into a prototype field MIS.

The Software Groups's Enable™ Version 2.0 was used to automate the following information categories: Logistics Information, Airfield Information, Geographical Information, and Manpower Requirements By Task. The resulting package, Bare Base Management Information System (BBMIS), is an easy-

to-use, integrated program designed to insure bare base CE commanders have prompt, concise, and accurate management support information at their fingertips. With a small amount of training and no knowledge of Enable, the user can perform all of BBMIS's basic operations. The program was designed for the Zenith™ Z-184 laptop personal computer for ease of transportation and use while in the field.

Although other information categories identified by the experts must be incorporated into the BBMIS program to supply all the commander's information needs, the prototype developed in this research demonstrates that a deployable management information system, based on validated requirements, is both conceptually sound and possible with current technology.

# A MANAGEMENT INFORMATION SYSTEM FOR BARE BASE CIVIL ENGINEERING COMMANDERS

## I. Introduction

### General Issue

Air Force Civil Engineering forces are tasked to deploy under several different wartime scenarios. These deployment scenarios range from augmenting US forces at established air bases to constructing and maintaining fully operational air bases in austere locations throughout the world (43:17). The latter of these possibilities is referred to as a bare base. Air Force (AF) policy dictates that a bare base will be capable of launching and recovering aircraft within 72 hours after employment (41:1-1). This requirement makes the bare base scenario one of the most challenging tasks facing Air Force Civil Engineering (AFCE) today--yet the essential information needed to accomplish the bare base mission is often least accessible.

Presently, the decision support information needed for a bare base deployment is found in various forms (such as manuals, regulations, publications) and requires extensive research to extract specific data (40:2). The time constraints associated with the bare base scenario dictate that the bare base Civil Engineering (CE) commander have

prompt, concise, and accurate information at his fingertips. This need can best be met through the use of modern computer technology.

## Specific Problem

The general issue described above is summarized in the following research question: How can a computerized management information system (MIS) improve the availability of the support information needed by the CE commander during the initial stages of a bare base deployment when timeliness and accuracy are most important?

## Research Objective

The purpose of this research was to design and assemble a computerized management information system that can be effectively used during the initial beddown stage of the bare base scenario. A prototype MIS computer program was designed and assembled on a portable microcomputer for use by the bare base CE commander and his staff.

## Investigation Questions

In order to investigate the feasibility of developing a bare base MIS, the following investigation questions were answered:

1. What categories of unclassified information does a deploying CE commander require in the initial stage of a bare base scenario?

2. What, if any, commercial software is available that can manage these needed categories of information?

3. Concerning the specific information within categories, where and in what form is this information available?

4. Of the information identified in investigative question 3 that is already programmed for computers, what programming languages were used and what hardware and software are required to run the programs?

5. What computer user interface features will provide CE commanders with the information they need in an easy-to-use format?

6. By synthesizing commercial and Air Force software, how can an integrated program be developed to provide the categories of information needed by the bare base CE commander?

Scope/Limitations

The scope and limitations of this research effort are outlined below.

1. There are numerous categories of information that could directly support the CE commander during a bare base deployment, and these categories will be identified to answer investigative question 1. However, for the purpose of this study, only four information categories will be included in the integrated program. The selection of these categories

will be discussed further in the methodology chapter of this thesis.

2. The integrated program was designed for use during the initial phase of the bare base scenario. The initial or beddown phase ends once all essential facilities are in place and on line, or when the bare base is established to the point of launching, turning around, and recovering combat sorties.

3. The integrated program was demonstrated using unclassified information for a bare base site located in Southwest Asia.

4. The Zenith(R) Z-184 laptop personal computer (PC) was the hardware used in developing the bare base MIS program. This choice is justified for two reasons. First, the Zenith Z-184's self-contained, battery powered design makes it well suited to field applications. Second, the Zenith Z-184 has recently been purchased by the Air Force, thereby making future widespread application of a bare base management information system easier (3:33).

5. Software considerations were limited to those available through routine Air Force supply procedures. This research focused primarily on using off-the-shelf commercial and Air Force software.

6. The intent of this research was to develop a bare base MIS so that its usefulness to the field CE commander could be demonstrated. This being the case, emphasis was

placed on integrating the information category into one program rather than analyzing and developing each category to its fullest. To adequately automate these information categories, a full scale research effort into each category would be needed. In their book, The Management of Information Systems, Mr. Gary W. Dickerson and James C. Wetherbe recommend that software be developed using a team concept consisting of system analysts, programmers, and user liaisons (13:56). This type of analysis was beyond the scope of this research.

## Assumptions

The following assumptions are made for this research:

1. Each AFCE bare base construction team will have an individual trained in the set-up and operation of the Zenith Z-184 laptop computer. Beyond the simple set-up steps, no computer or programming skills are required of the operator.

2. The environmental operating parameters (e.g., maximum temperature and humidity) for the Zenith Z-184 will not be exceeded or, alternatively, Z-184 computers sufficiently "hardened" to withstand harsh environments will be available for bare base deployments. Further research is required in this area before implementing an automated field management information system on the Z-184 personal computer.

3. This research focuses on AFCE Prime BEEF (Base Engineering Emergency Force) operations, and excludes all Fire Department and Red Horse Squadron contributions.

## Definitions

The following list of terms is provided for reference purposes.

Bare Base. A base having a runway, taxiways, parking areas adequate for the deployed force, and possessing an adequate source of water which can be made potable (43:50).

Collocated Operating Base (COB). "A base hosted by an ally can be used to bed down USAF augmenting forces. COBs require civil engineering support to accommodate reception, beddown, launch/recovery of USAF aircraft" (25:6).

Contingency. "An uncertain future event sufficiently within the realm of possibility to warrant advance planning which includes potential military operations, civilian or military emergencies, and natural disaster relief" (43:50).

Deploy. "To relocate a unit, or an element of it, to an area of operations or to a staging area. Deployment begins when the first aircraft, personnel, or items of equipment leave the home base. The force is deployed after the last component of the unit has departed" (43:50).

Employ. "To perform an assigned mission at the deployment location" (25:7).

Force Beddown. "Engineering tasks required to provide facilities necessary to support the mission of incoming personnel" (25:7).

Forward Operating Location (FOL). "An airfield used to support tactical operations without establishing full support facilities. The FOL may be used for an extended time period. Support by a main operating base will be required to provide backup support for a FOL" (43:51).

Harvest Bare. Nickname given to a bare base system. Harvest Bare is a concept in mobility which offers deployment of all supporting buildings to a bare or fixed base. These buildings are of light, modular design and may serve as containers for those items used in the building when set up. Harvest Bare consists of shelters, utilities, and base maintenance equipment and support subsystems. Harvest Bare assets are designed to support up to 4500 personnel in various increments and are designated as War Reserve Materiel and maintained in a ready-to-deploy status (43:51). Harvest Bare uses hard-wall construction and modern technology as opposed to tents (53:25).

Harvest Eagle. Nickname given to a selected package of essential items of equipment and supplies required to support forces/personnel under bare base conditions. It is an air transportable housekeeping package designed to support activities deployed to remote areas where it is not feasible to pre-position assets. Each Harvest Eagle set is designed to support up to 1100 personnel. The sets are designated as War Reserve Materiel and maintained in a ready-to-deploy status (43:51). Harvest Eagle is based on the use of tents for field kitchens, medical facilities, and the like, as opposed to the hard-walled construction of the Harvest Bare kits (53:24).

Harvest Falcon. "A nickname for an air transportable package of hard-wall and soft-wall (tents) shelters and equipment required for base and personal housekeeping and aircraft support in bare base conditions. Harvest Falcon operates under the same concept as Harvest Bare in that it provides support for sustained wartime operations. Harvest Falcon, however, uses tents in lieu of hard-wall shelters for most housekeeping (billets, kitchen, showers) support. Although Harvest Falcon could be deployed to support operations almost anywhere in the world (no freeze protection), the package was developed and sized to support operations in Southwest Asia (SWA). The entire package will be prepositioned in SWA" (43:51).

War Reserve Materiel (WRM). "War reserve materiel is that materiel required in addition to peacetime assets, to support the planned wartime activities reflected in the United States Air Force War and Mobilization Plan. War reserve materiel includes station sets, housekeeping sets, munitions, tanks, racks, adapters, pylons, spares and repair parts, air transportable housekeeping equipment and supplies, base augmentation and maintenance/operations support sets, vehicle reserve sets, chemical equipment and supplies, biological defence equipment and supplies, aviation and ground petroleum, oil and lubricants, rations, and supplies designated or authorized as war reserve materiel in accordance with established policies" (43:54).

# II. Literature Review

## Introduction and Chapter Overview

The bare base concept involves rapidly deploying civil engineering forces, complete with shelters and support facilities, capable of independently supporting sustained combat operations (41:2). The ambitious task just described presents numerous challenges to on-site engineers, planners, and managers. This chapter serves three distinct purposes. First, it establishes a common ground to evaluate the feasibility of a field MIS by defining the bare base concept from a historical perspective. Second, it provides the reader with an overview of the regulations that govern bare base deployments. Finally, it investigates previous research efforts that have contributed to the information demands of bare base planners. Any literature found to support this study's investigative questions was presented in the results chapter.

## What is a bare base?

A bare base, by definition, is "A cleared area of sufficient size to support tactical aircraft operations, but offering no physical facilities other than a usable runway, parking areas, and a source of water" (9:4). The Air Force Engineering and Service Center (AFESC) Bare Base Conceptual Planning Guide describes the general requirements for a bare base deployment:

> It [bare base] must be capable of supporting assigned aircraft; providing landing/recovery surfaces; and providing other mission essential resources such as a logistical support and services infrastructure composed of people, facilities, equipment, and supplies. This bare base concept requires mobile facilities, utilities, and support equipment that can be available to transform--virtually overnight--undeveloped real estate into an operational air base [41:1].

To fully understand a problem, one must appreciate its history. The following section takes the reader from the inception of the bare base concept during World War II to the present.

## Historical Perspective

The need for mobile air bases emerged with the advent of modern air warfare tactics during WW II (9:2). These tactics called for base support forces to move to forward staging areas by ground transportation and then transform the site into an acceptable platform for launching and recovering aircraft (1:5). The tactical air forces would then "move from one forward operating base to another in order to keep up with and provide air support for the advancing troops" (41:1). This leap-frog deployment method repeated itself whenever the battle zone changed. Tactical operations were typically supported from any structure available (i.e., farmhouses and barns) with aircraft maintenance normally accomplished in the open (1:28). "The net result of this type of mobility was inefficiencies, high costs, and marginal effectiveness during the build-up phase at each new location"

(54:2). Even after identifying these drawbacks, the basic deployment concept and support equipment remained unchanged through the Korean conflict.

The first significant change to the mobile air base concept came when President John F. Kennedy announced his "flexible response" strategy in January of 1963. The flexible response strategy required the military to contend with any level of conflict across the spectrum of warfare (1:30). This political decision prompted military planners to develop pre-packaging techniques for base support equipment which, in the past, was strategically stored for contingencies (1:6). "These prepositioned packages, called Gray Eagle kits, contained tents, field kitchens, medical facilities, power generators, collapsible cots, dishes, and other base support items" (1:6). This basic mobility kit was soon redesigned to facilitate air transportability and was renamed Harvest Eagle (41:1). Through the years, the basic kit has been updated and modified to meet current needs and missions. These mobility kits will be reviewed in more depth later in this chapter.

The Nixon Doctrine, of the late 1960's, further modified the air base mobility concept. In an Air War College research paper, Lieutenant Colonel Robin M. Woodruff reviewed the contents of the Defense Report on President Nixon's Strategy for Peace:

> The Nixon Doctrine calls for a low profile and a generally reduced military presence world-wide. In

> consonance with this doctrine, the strategy of realistic deterrence relies on a modernized force with the mobility required to respond quickly to any contingency when US interests are threatened. In some situations, timeliness of response or presence could be more important than a maximum force that would take longer to deploy [54:1].

This doctrine provided the impetus for the development of what is now known as the Bare Base Concept (1:95). The following is an excerpt from Tactical Air Command (TAC) pamphlet Project 3782-Bare Base Mobility outlining the new bare base mobility philosophy:

> International uncertainty requires that tactical air forces be postured, organized, trained, and maintained to meet all types of contingency situations. Tactical airpower has been the primary force employed in meeting various contingencies since the conclusion of World War II. To meet global contingencies, tactical airpower must be mobile in order to confront a would-be aggressor with immediate combat power. Thus, the ability to rapidly deploy, posture for combat, and begin immediate operations are the key features of our tactical air force if it is to be an effective deterrent to aggression. To this end, the rapid buildup from a bare base must be a fundamental ingredient of our capability. Tactical air mobility means getting firepower where it's needed, when it's needed at strength levels that will assure air superiority, a decisive factor in today's conventional warfare. Anything short of this means fixed-base forces are not being used most effectively, or to full dollar value [48:16].

Although many changes to mobility equipment and employment tactics have developed since the late 1960's, the basic bare base theory has remained fairly stable.

"Today's mobility concept is to rapidly deploy a force, complete with shelters and support facilities, capable of independently launching sustained combat operations with the

same independence as fixed theater installations" (41:2). This tasking requires the "use of lightweight, modular, structures and equipment designed for rapid air transportation and rapid erection at a bare base location" (1:95). The Harvest Eagle assets fulfill part of this role, but a new line of mobility equipment was needed for sustained operations at austere locations throughout the world. Thus, an air transportable, hard-walled deployment kit known as Harvest Bare was created.

Bare Base Support Equipment

"The nucleus of today's bare base infrastructure centers around enhanced versions of earlier Harvest Eagle and Harvest Bare equipment" (41:2). Harvest Eagle assets consist mainly of soft-wall shelters and support equipment generally used on short duration deployments. One Harvest Eagle set can provide enough tents and housekeeping items to support a force of 1,100 people. Each of the four existing Harvest Eagle sets is completely air transportable and "maintained in a ready-to-deploy status" (43:51).

The Harvest Bare assets, on the other hand, consist of hard-wall, accordion type structures that are air transportable and easy to erect. The Harvest Bare kit goes beyond Harvest Eagle's housekeeping assets by providing "vehicular support, general aircraft maintenance, specific weapons systems, and a broad base of logistic support for sustained operations of a 4,500-person wing" (41:2).

Recently, a third type of bare base beddown system was developed--Harvest Falcon. This new system is a hybrid collection of Harvest Eagle and Harvest Bare assets modified for use in the Southwest Asian theater (43:51). The soft-wall shelters have been set aside for billeting and administrative purposes while the hard-wall assets are used for operational activities such as aircraft maintenance, building maintenance, and vehicle support (43:51). Presently, all the Harvest Falcon assets are prepositioned in Southwest Asia (43:51).

Governing Regulation

"The Prime BEEF program is a HQ US Air Force, major command (MAJCOM), and base-level program that organizes civil engineering forces for worldwide combat support and combat service support roles" (43:6). The origin of the Prime BEEF program is Air Force Regulation (AFR) 93-3, Air Force Civil Engineering Prime Base Engineer Emergence Force (BEEF) Program. This document outlines the policies and procedures defining AFCE's combat readiness arm, to include force structure, training prerequisites, and operational requirements.

Under the newly developed combat support (CS) team concept, civil engineering forces will "train as organic units, and deploy as fully capable combat engineering squadrons" (17:18). Each engineering unit will be "tied" to

a specific flying unit to perform engineering tasks associated with sortie generation (43:7). "This support encompasses everything from routine maintenance and repair of facilities and utilities to beddown of deployment forces and emergency war damage of air bases" (43:6). A core CS team is comprised of 200 civil engineers, trained in all basic skills needed "to establish BCE [Base Civil Engineering] operations or to accomplish the most critical of wartime tasks at locations where additional assistance is required or where none exists" (43:16). One of the most challenging tasks assigned a core CS team is deploying on a 22-hour notice to beddown and support aircraft operations at forward operating location and bare bases which can have populations ranging as high as 2500 people (43:16). To accomplish this task, deployed civil engineering planners require large amounts of detailed and specialized information. In the past, this information could only be accessed by manual searches through numerous regulations, handbooks, and field manuals. A partial listing of the documents needed by a deploying CE planner is provided in Appendix A.

Previous Research

Over the past few years, several research efforts have addressed the problem of how to give faster access to information needed by CE planners before and during bare base deployments.

Research by the Air Force Engineering and Services Center. The cornerstone of this research is the Bare Base Conceptual Planning Guide, developed by the Air Force Engineering and Services Center at Tyndall AFB, Florida. This guide provided bare base planners and engineers

> a step-by-step description of the type of shelters, utilities, and support items that are available for bare base, as well as the procedures for installing and erecting these assets. It is, in effect, a checklist to insure that each crucial item which affects the base's ability to survive and operate is covered [2:20].

The authors of this guide accomplished the task of consolidating much of the essential bare base planning and construction information found in numerous regulations, manuals, and pamphlets into a compact handbook. The purpose of the Bare Base Conceptual Planning Guild is to provide the bare base CE commander with a brief overview of most of his engineering support requirements.

Research by Major McNickle. Major Paul J. McNickle, a 1983 Air Command and Staff College student, expanded the information available to deploying CE commanders by developing a handbook of essential facilities for tactical aircraft beddown at a bare base. This report provides a summary of the basic information about the mission essential facilities which directly support deployed aircraft (26:4). It also provides invaluable insight into planning and organizing CE tasks and resources during forward operating base or bare base deployments (26:4).

Research by Captain Carson and Captain Nadler. In fulfillment of their 1983 Air Force Institute of Technology (AFIT) thesis requirement, Captains William J. Carson and Bruce R. Nadler designed a computer program to assist Air Force planners prepare force beddown site plans. This program enabled Air Staff planners to "draw on consolidated information concerning the sizing of eight major facility group functions: munitions storage area, aircraft maintenance area, aircraft refueling area, flight operations area, command area, base support area, cantonment area, and medical area" (8:1). Carson and Nadler's computer graphics program allows planners to rapidly locate functional areas while ensuring all fire, explosive, and airfield safety distance criteria are being observed. They based their program on the airfield spacing requirements found in the force beddown portion of Air Force Manual (AFM) 86-3, Planning and Design of Theater Operations Air Bases (8). "One of the features of this program is the automatic generation of construction Bill of Materials" (8:3).

Research by Captain Van Dalsen and Lieutenant Tucker. In another 1983 AFIT thesis, Captain Danny E. Van Dalsen and Lt Douglas K. Tucker automated many of the master planning features found in the Bare Base Conceptual Planning Guide (39). "The automation of this data enabled [Air Staff] planners to rapidly prepare facility layout patterns for force beddown requirements" (5:3). The focus of Van Dalsen's

and Tucker's research was to develop a prototype decision support system which would be used by bare base planners at Air Force MAJCOM level (40:ii). Specifically, their thesis addressed four general areas of decision support for bare base planners:

> (1) Developing a 'menu-driven,' user-friendly program which 'steps' the user through the process of bare base planning on the computer.
>
> (2) Developing a computerized data base of site-specific information and providing the capability to list this information to the computer terminal display when requested by site name. This puts basic site-specific information at the planner's fingertips.
>
> (3) Providing an automatic display of utility system assets (Harvest Bare, Harvest Eagle, or a combination of both).
>
> (4) Developing a graphical planning capability to include the display of typical airfields as shown in the Bare Base Conceptual Planning Guide. This graphical planning capability includes the capability to automatically display available Harvest Bare/Harvest Eagle assets, and provided for automatic reduction in quantities available as these assets are used by the planner [40:8].

The program was written in FORTRAN 77 for use on the VAX 11/780 mainframe computer. All the information contained within the program is unclassified (40:9).

Research by Captain Martin. In a 1984 AFIT thesis, Captain Chal A. Martin compiled site specific information on over 200 Southwest Asian airfields. With this information, Martin developed a field-manual that details regional topographical and geographical characteristics of potential Southwest Asian bare bases. "Topics include Islamic

religious, cultural, and business customs; regional health information; desert engineering considerations; climate; maps showing airfield locations, and concise descriptions of 240 airfields in the region that could support tactical operations" (25:i). Martin designed his thesis so that the purely academic sections could be removed, leaving a self contained, fully indexed deployment manual for use by bare base CE commanders while in the field (25:5).

The next logical step in this sequence of research is to automate essential management support information in a way that can be rapidly accessed by the bare base CE commander while in the field.

# III. Methodology

## Chapter Overview

This chapter contains the information and the process taken to answer the investigative questions identified in Chapter I. Data collection techniques and specific methodologies are addressed for each investigative question.

## Specific Methodology

The following steps were taken in answering the six investigative questions stated in Chapter I.

### Investigative Question 1.

> What categories of unclassified information does a deploying CE commander require in the initial stages of the bare base scenario?

The answer to this question came from three sources: regulations, exercise documents of previous bare base exercises, and knowledgeable individuals. The regulations were examined for all statements of responsibility of the deployed CE commander. Next, a detailed review of trip reports and "lessons learned" articles about past bare base deployments was conducted to identify additional categories of information. Finally, primary source data was obtained through interviews with CE commanders and MAJCOM planners of past bare base exercises. These interviews were semi-structured, in the manner used successfully by Capt L. D. Waggoner and Lt M. A. Moe (50), thereby encouraging the

interviewee to provide the widest breadth of information possible.

Informational requirements extracted from these sources were grouped into similar categories. The interviewees were then asked to rank these categories in order of relative importance. A frequency analysis was used to formulate the overall priority listing.

Investigative Question 2.

> What, if any, commercial software is available that can manage these needed categories of information?

The second investigative question was answered by interviewing software consultants for each of the information categories identified in question 1 and soliciting their suggestions for commercial software packages that would fulfill the bare base information requirements. Additionally, this study reviewed relevant literature to determine if the software packages suggested by the consultants would in fact fulfill these requirements. Finally, four of the informational categories identified in question 1 were selected for inclusion in the bare base MIS program. This selection was based on the availability of software which could support these information requirements. Only those information categories that could be automated with commercial or Air Force developed software were considered for the integrated program.

Investigative Question 3.

> **Concerning the specific information within categories, where and in what form is this information available?**

Four of the information categories identified in question 1 for which there was commercial or AF software available were incorporated into the integrated program. Based on preliminary investigations, the information categories of Critical Path Method (CPM) analysis, site layout, logistics management information, and regional geographical information were thought to be likely candidates. It was the study's original plan that these information categories would be used to illustrate the research methods to be applied to the four categories actually selected to answer this investigative question. As described in the results chapter, the categories later identified by the research differ somewhat from the original list. However, since the list served to give structure to the research design at the early stages of planning, the categories and appropriate methodology are briefly described below:

1. Critical Path Method: Review the literature to see if any planning/scheduling guide or program has been developed for use in a bare base deployment. If none exists, consolidate what planning information is available so that it can be incorporated into the integrated program.

2. Site Layout: Review the literature to determine what layout information or programs exist for the bare base scenario.

3. Logistics Information: Review current literature to determine if an automated system for managing bare base resources has been developed. If any such programs exist, they would be evaluated for their utility during a bare base deployment. If no acceptable logistics program were found, the literature would again be used to identify what assets should be provided for a typical bare base deployment.

4. Geographical Information: Review the literature to determine what information has been accumulated in this information category and whether this information has been automated. If automated, the information would be evaluated for its utility during a bare base deployment.

Investigative Question 4.

> **Of the information identified in investigative question 3 that is already programmed for computers, what programming languages were used and what hardware and software are required to run the programs?**

A thorough review of the documentation for each computer program was conducted to identify its hardware (e.g., Random Access Memory (RAM), operating language, printer requirements), software (e.g., dBASE III Plus(R), Lotus 123(R)), and programming language (e.g., FORTRAN, Pascal)

requirements. Programs that are not compatible with the Zenith Z-184 PC were eliminated from consideration.

Investigative Question 5.

> **What computer user interface features will provide CE commanders with the information they need in an easy-to-use format?**

The fifth investigative question was answered by developing a list, based on current literature, of desired user interface features. Additions and improvements to this list were solicited from software consultants. The top four features, as prioritized by the consultants, made up the selection criteria for the integrated program.

Investigative Question 6.

> **By synthesizing commercial and Air Force software, how can an integrated program be developed to provide the categories of information needed by the bare base CE commander?**

The last investigative question was answered by developing a computer program that integrated existing bare base specific programs and commercial software into a package for the CE commander to use during the initial stage of a bare base deployment. This program uses representative data bases to demonstrate how an automated system can meet the needs of the bare base CE commander. It was validated by having two groups of individuals (with varying degrees of familiarity with personal computers) review the program and provide recommendations for improvements. Most of the recommendations were incorporated into the bare base MIS program. Some recommendations were not incorporated because

they were beyond the scope of this study or insufficient time remained for reprogramming. A list of these recommendations is included in Chapter IV of this report.

# IV. Results

## Chapter Overview

This chapter contains the summary and analysis of information received from interviewing bare base experts and computer software consultants, as well as reviewing pertinent literature to answer the investigative questions presented in Chapters I and III. In general terms, this chapter identifies the categories of information needed by the bare base CE commander, evaluates each category against established automation constraints (both hardware and software), and demonstrate how four of these information categories can be synthesized into an integrated management information system.

## Investigative Question 1

> What categories of unclassified information does a deploying CE commander require in the initial stages of the bare base scenario?

Applicable regulations, bare base exercise documents, and interviews with past bare base CE commanders and MAJCOM planners (hereafter referred to as experts) were used in answering this question. Civil Engineering's contingency response regulations were the primary source for identifying information categories. Exercise documents and interviews with experts completed the body of information categories, but more importantly, they served to verify and prioritize the final list of categories.

Review of Regulations. The regulations listed below were reviewed to identify those Civil Engineering bare base responsibilities which could be accomplished more effectively if the information needed to manage the tasks were readily accessible through automation:

- AFR 93-3, Air Force Civil Engineering Prime Base Engineering Emergency Force (BEEF) Program, 20 Nov 87.
- AFR 93-2, Contingency Response Plan, 11 Dec 79.
- AFR 93-10, Troop Construction And Engineering Support of the Air Force Overseas, 15 May 79.

Once the deployment responsibilities were identified, they were independently evaluated using two questions. First, what general information does the bare base commander need to accomplish his assigned tasks? Second, how can this information be presented in a useful manner using the previously established software and hardware constraints? The constraints, found in the Scope/Limitations section of Chapter I, are restated here for the reader's convenience. The hardware of choice will be the Zenith Z-184 portable computer, and therefore only Z-184 compatible software will be considered. Additionally, the software must be procurable through routine AF supply channels.

Using the two evaluation questions stated above as a basis, deployment taskings were matched with general information categories. These information categories were designed to give bare base CE commanders the managerial information needed to accomplish each task quickly and

effectively. For example, automated work schedules such as Critical Path Method or Program Evaluation and Review Technique (PERT) could be used to help the CE commander manage the multitudes of deployment tasks associated with force beddown, war damage repair (WDR), and operations and maintenance (O&M) activities.

Bare base deployment responsibilities extracted from applicable CE regulations and their corresponding information category are summarized in Table I.

Table I

Deployment Responsibilities and Associated Information Categories From CE Regulations

| Deployment Tasks/Sources | Information Categories |
|---|---|
| - Manage force beddown operations (43:16,44:4,49:3).<br>- Manage follow-on war damage repair (WDR) operations (43:16,44:4,49:3).<br>- Manage operations and maintenance (O&M) activities (43:16,44:4,49:3). | - Automated Work Schedule (CPM, PERT, etc.) |
| - Manage force beddown operations (43:16,44:4,49:3).<br>- Maintain information on employment location including maps (43:14). | - Automated Bare Base Layout |
| - Manage and acquire material and equipment (44:4,43:19,49:3).<br>- Manage force beddown operations (43:16,44:4,49:3). | - Logistics Information |
| - Maintain information on employment location including maps (43:14).<br>- Manage force beddown operations (43:16,44:4,49:3). | - Geographical Information |
| - Manage, coordinate, and supervise assigned personnel (43:19). | - Personnel Management (Background, Training, etc.) |

Table I (cont.)

Deployment Responsibilities and Associated Information Categories From CE Regulations

| Deployment Tasks/Sources | Information Categories |
|---|---|
| - Manage follow-on war damage repair (WDR) operations (43:16,44:4,49:3).<br>- Manage operations and maintenance (O&M) activities (43:16,44:4,49:3). | - Work Order Assignments |
| - Install, operate, and maintain equipment, including portable shelters and aircraft arresting equipment (43:24). | - "How To" Instructions (Harvard Bare Instr., etc.) |
| - Acquire material and equipment (44:4).<br>- Perform contract management of WDR efforts (43:16,49:3). | - Procurement Support (Product data, Specs., etc.) |
| - Maintain information on employment location (43:14). | - Automated Translator (e.g., Hello --> Hola) |
| - Perform nonexplosive base denial operations (43:24).<br>- Develop contingency response plans (43:14). | - Base Denial Plan and Schedule |
| - Manage force beddown operations (43:16,44:4,49:3).<br>- Manage follow-on war damage repair (WDR) operations (43:16,44:4,49:3).<br>- Manage operations and maintenance (O&M) activities (43:16,44:4,49:3). | - Manpower Requirements By Task |
| - Support rapid runway repair, airfield lighting, and arresting system installation and maintenance (43:24). | - Airfield Information (Pvmt size, type, etc.) |
| - Maintain command, control, and communications (43:16).<br>- Maintain administrative support (43:19).<br>- Support command staff (43:24). | - Administrative Support (Messages, Reports, etc.) |
| - Perform explosive ordinance reconnaissance (EOR) (43:24). | - Expert System (EOR Operations, etc.) |
| - Perform WDR operations in priority in order (44:4).<br>- Manage force beddown operations (43:16,44:4,49:3). | - Prioritized List of Mission Essential Facilities |

Review of Exercise Documents. Bare base exercise documents and after-action reports were reviewed, in the same manner as the regulations, in order to extract additional deployment tasks. These tasks were also linked with the appropriate information category. Documentation from the following exercises was reviewed in support of this research:

- Bright Star '85
- Bright Star '87
- Gallant Eagle '86
- Proud Phantom '80

This review yielded one additional deployment responsibility beyond those specified in the regulations, and it verified many of the responsibilities previously identified in the regulations. The additional deployment tasking mentioned in the exercise documents occurred during Bright Star 85. During this four-month deployment, the airfield had deteriorated to the point that immediate repairs were needed. The damages were extensive enough that sections of the pavement had to be redesigned before repairs could be made. This task highlighted the need for an automated system that could perform simple pavement designs quickly and easily. Such a program would allow engineers in the field to quickly analyze several repair options from which the optimal design could be selected. A general design program could be developed, in future research, to assist in not only pavement

design but also designs of expedient water and electrical distribution systems.

Table II shows a complete list of information categories corresponding to the deployment taskings identified in the regulations as well as the new requirement extracted from the exercise documents.

Consultation With Bare Base Experts. The final step in answering investigative question 1 was to interview CE commanders and MAJCOM planners of past bare base exercises. The experts listed below were chosen because of their broad range of experience in contingency planning and force beddown operations.

- Lt Col Thomas M. Hanson
  -- Bright Star '85 CE Commander (21)

- Capt Stephen Petryszyn
  -- Bright Star '87 CE Commander (Operations Site) (31)

- Capt Michael G. Carson
  -- Bright Star '87 CE Commander (Command & Control Site) (7)

- Capt James R. Mills
  -- Chief of Readiness, HQ SAC
  -- Busy Prairie II '80
  -- Bright Star '83
  -- Gallant Eagle '83 (27)

- Mr. Robert W. Fox
  -- Readiness Planner, HQ SAC (18)

- Capt Francis D. Wilson III
  -- War Mobility Planner, HQ Central Air Force (CENTAF)
  -- Gallant Eagle '86 (52)

Table II

Deployment Responsibilities and Associated Information Categories
From CE Regulations and Exercise Documents

| Regulations Requirements | Exercise Requirements | Information Categories |
|---|---|---|
| - ***** | - Perform asphalt and concrete design (22). | - Engineering Design Support (Pvmt., Elec. distribution) |
| - Manage force beddown operations (43:16,44:4,49:3).<br>- Manage follow-on war damage repair (WDR) operations (43:16,44:4,49:3).<br>- Manage operations and maintenance (O&M) activities (43:16,44:4,49:3). | - Erect and maintain cantonment area (46:1,2).<br>- Scheduling charts and tables used (22, 47:Atch 2).<br>- Job Order assignments required (47:Atch 46, 22). | - Automated Work Schedule (CPM, PERT, etc.) |
| - Manage force beddown operations (43:16,44:4,49:3).<br>- Maintain information on employment location including maps (43:14). | - Be able to site adapt given layout plans (46:1).<br>- Hand drawn layout plans used (47:Atch 46, 22). | - Automated Bare Base Layout |
| - Manage and acquire material and equipment (44:4,43:19,49:3).<br>- Manage force beddown operations. (43:16,44:4,49:3). | - Erect and maintain cantonment area using Harvest assets (46:1, 16:4).<br>- Advanced notice of resupply requirements are needed (46:3).<br>- Mange water consumption (46:19, 47:Atch 1).<br>- Perform material control operations (46:4, 45:2). | - Logistics Information |
| - ***** | - Be able to site adapt given layout plans (46:1).<br>- Hand draw layout plans used (47:Atch 3, 22). | - Topographical Information (i.e., 3-D elevations). |
| - Maintain information on employment location including maps (43:14).<br>- Manage force beddown operations (43:16,44:4,49:3). | - Require local soil conditions (46:59).<br>- Need local cultural information (i.e., dress) (22). | - Geographical Information |

Table II (cont.)

Deployment Responsibilities and Associated Information Categories
From CE Regulations and Exercise Documents

| Regulations Requirements | Exercise Requirements | Information Categories |
|---|---|---|
| - Manage, coordinate, and supervise assigned personnel (43:19). | - Need personnel management and training records (46:72, 22). | - Personnel Management (Background, Training, etc.) |
| - Manage follow-on war damage repair (WDR) operations (43:16,44:4,49:3).<br>- Manage operations and maintenance (O&M) activities (43:16,44:4,49:3). | - Need job order assignments (47:Atch 18).<br>- Establish and update a in-service work plan (46:3). | - Work Order Assignments |
| - Install, operate, and maintain equipment, including portable shelters and aircraft arresting equipment (43:24). | - Maintain and operate Harvest Assets (46:3, 16:4, 45:3).<br>- Inexperience with the operation and upkeep of Services equipment (16:6). | - "How To" Instructions (Harvard Bare Instr., etc.) |
| - Acquire material and equipment (44:4).<br>- Perform contract management of WDR efforts (43:16,49:3). | - Need to purchase items locally (46:6 & 18, 27:2).<br>- Difficult to obtain replacement parts (16:6). | - Procurement Support (Product data, Specs., etc.) |
| - Maintain information on employment location (43:14). | - ***** | - Automated Translator (e.g., Hello --> Hola) |
| - Perform nonexplosive base denial operations (43:24).<br>- Develop contingency response plans (43:14). | | - Base Denial Plan and Schedule |
| - Manage force beddown operations (43:16,44:4,49:3).<br>- Manage follow-on war damage repair (WDR) operations (43:16,44:4,49:3).<br>- Manage operations and maintenance activities (43:16,44:4,49:3). | - Assigned tasks by crews (47:Atch 15).<br>- Erect and maintain cantonment area (46:1, 2). | - Manpower Requirements By Task |

Table II (cont.)

Deployment Responsibilities and Associated Information Categories
From CE Regulations and Exercise Documents

| Regulations Requirements | Exercise Requirements | Information Categories |
|---|---|---|
| - Support rapid runway repair, airfield lighting, and arresting system installation and maintenance (43:24). | - Prepare aircraft parking plan (46:1).<br>- Perform asphalt and concrete design (22). | - Airfield Information (Pvmt size, type, etc.) |
| - Maintain command, control, and communications (43:16).<br>- Maintain administrative support (43:19).<br>- Support command staff (43:24). | - Send messages and reports daily (46:5, 47:Atch 20). | - Administrative Support (Messages, Reports, etc.) |
| - Perform explosive ordinance reconnaissance (EOR) (43:24). | - ***** | - Expert System (EOR Operations, etc.) |
| - Perform NOR operations in priority in order (44:4).<br>- Manage force beddown operations (43:16,44:4,49:3). | - ***** | - Prioritized List of Mission Essential Facilities |

Research Objectives for Experts. These individuals were asked to provide essential information regarding the content and priority of the information categories. The experts were requested to participate in the following activities:

a. Review and confirm or reject the information categories identified from the regulations and exercise documents. Also, add any additional categories that would be helpful to a deployed CE commander.

b. Rank order the top seven information categories. From this list, the four highest priority categories will be carried forward to evaluate for inclusion into the integrated program.

c. After the four highest priority categories have been chosen, identify the operating features for each of these information categories.

The procedure used in carrying out these activities was somewhat complex. Therefore, a brief overview of the specific methodology used in this portion of the research is presented.

Data Collection Procedure. To carry out the activities stated above, a three-step data collection procedure was used. First, a semi-structured interview served to introduce the topic to the interviewees and gather general information about their deployment experiences. The primary purpose of this interview was to confirm the information categories already identified and to solicit any additional categories they felt would be helpful in the field. Once this interview was completed and synthesized, a comprehensive list of the information categories was

assembled and sent out to the experts. They were asked to 1) review the list for completeness and to again add any additional information categories, and 2) to prioritize the top seven categories with regard to utility and importance to the bare base beddown mission. With this information, the top four categories were then chosen based on frequency of selection and ranking by the experts. Finally, an unstructured interview was conducted to determine how the experts would use each of the four information categories identified. The results of this interview served as the desired software operating features used in selecting the software (investigative question 2) and in designing and assembling the integrated program's modules (investigative question 6).

First Objective. The first objective for the bare base experts was accomplished with the semi-structured interview presented in Appendix B. The interview began by introducing the experts to the basic tenants of the research and requesting background information regarding their bare base experiences. The remainder of the interview was designed to have the experts identify specific deployment tasks and the general information categories needed for bare base deployments. The interviewees were asked a number of questions regarding sources, availability, and demand for information which assisted in force beddown operations. Initially, the experts responded freely, without any

prompting or guidance from the interviewer. After no additional information requirements were independently proposed, they were provided information categories identified in the regulations and exercise documents. The interviewees were then asked to comment on the utility of each information category presented. In essence, the experts were asked to confirm or reject each information category.

The semi-structured format proved to be more valuable than originally expected. It allowed the interviewer to clear up any misunderstandings regarding beddown requirements and their corresponding information categories. It also allowed the interviewees the freedom to provide useful, grass-roots insight into the informational demands placed on a CE commander during the initial beddown phase of a bare-base exercise.

All of the information categories identified in the regulations and exercise documents were confirmed by the experts as being useful in field operations. The additional deployment requirements and information categories identified by the experts are presented in Table III.

In addition to the information categories identified in the regulations, the interviewees revealed a need for topographic information and an automated version of the Bare Base Conceptual Planning Guide.

Table III

Deployment Tasks Identified by Bare Base Experts With Corresponding Information Categories

| Additional Deployment Tasks/Sources | Additional Information Categories |
|---|---|
| - Needed a topographical view of the site for planning purposes. It should be able to be updated while in the field (21, 31, 27) | - Topographic Information |
| - "The Bare Base Conceptual Planning Guide was an invaluable tool both before and during the deployment. The planning factors could easily be automated to make it even more attractive" (31). | - Automated Bare-Base Conceptual Planning Guide |

Second Objective. With the information categories identified, work on the second objective could begin. The experts were sent a survey which listed all the information categories, while leaving room for additional categories and comments. They were asked, in the accompanying instructions, to review the list of information categories and add any additional unclassified categories they felt would be helpful to a deployed CE commander. The experts were then requested to prioritize the seven information categories they considered to be most important. The survey instrument sent to the experts is presented in Appendix C. Before discussing the findings of this objective, a few observations regarding the survey instrument itself are in order.

This survey instrument provided an effective means of collecting data for a number of reasons. First, all the information categories are presented on one sheet of paper. This relieved the experts from having to flip through several pages when trying to compare and prioritize information categories. Second, the instructions were designed to be as simple and easy to understand as possible, thereby minimizing the possibility of misunderstandings. Third, the survey requires very little time to fill out (approximately 7 - 10 minutes). This feature allowed the experts to devote more of their time contemplating their responses rather than filling out the survey. Finally, only seven of the nineteen information categories were prioritized. Research by Dr. Mildred Parten, of the University of Rochester, has shown that no more than twelve items can be effectively rank ordered simultaneously (29:188). The goal here was to design a survey to maximize the accuracy of the results obtained.

The results of this survey (which received 100% response) revealed one new information category beyond those identified during the interviews. Captain Wilson, War Mobility Planner for HQ CENTAF, called for a "site specific bare base beddown plan" (52). This requirement is similar to the information category which called for an automated version of the Bare Base Conceptual Planning Guide. Wilson's category, however, went one step further by specifying a comprehensive plan that incorporates the flying unit's

operations plan (52). With this information, the field CE commander would have a broader view of the bare base's mission objectives. Because of the late stage at which this information category was identified, it was not offered to the other experts for prioritization.

A complete listing of all the information categories identified in this research is presented below.

- Automated Work Schedule (e.g., CPM, PERT, etc)
- Automated Bare Base Layout
- Logistics Management Information
- Topographical Information
- Geographical Information
- Personnel Management Information
- Work-Order Tracking
- "How To" Instructions
- Engineering Design Support Information
- Procurement Support Information
- Automated Language Dictionary
- Base Denial Plan and Schedule
- Manpower Requirements By Task
- Airfield Information
- Administrative Support Information
- Expert System (e.g., trouble shooting equipment)
- Prioritized List of Mission Essential Facilities
- Automated Bare Base Conceptual Planning Guild
- Bare Base Beddown Plan

A complete summary of the rankings the experts assigned each information category is presented in Appendix D. It also shows the sum of those rankings and the number of times each category was rated as one of the top seven (frequency count).

The frequency count and sum of rankings were used in concert to prioritize the categories. A value of eight was assigned all information categories that were not ranked in the top seven by the experts. The frequency count was used

as a rough indicator of the information categories deemed most important by the experts. The sum of rankings was the deciding factor for assigning the overall ranking. A summary of this analysis is presented in Table IV.

Table IV

Summary of Information Category Rankings
(Top Four Categories Shown in Bold Face)

| Information Categories | Freq. Count | Freq. Count Priority | Sum of Ranking | Sum of Ranking Priority | Overall Priority |
|---|---|---|---|---|---|
| **Logistic Information** | 6 | 1 | 20 | 2 | 1 |
| **Airfield Information** | 5 | 2 | 17 | 1 | 2 |
| **Geographical Information** | 4 | 3 | 27 | 3 | 3 |
| **Manpower Req. By Task** | 4 | 3 | 34 | 4 | 4 |
| Topographical Information | 3 | 4 | 35 | 5 | 5 |
| Personnel Information | 3 | 4 | 41 | 7 | 6 |
| Procurement Support | 3 | 4 | 41 | 7 | 6 |

The frequency of selection shows some indication for the breadth of the need for the information category. For example, Logistic Information was selected by all six experts as being one of the top seven categories. Similarly, Airfield Information, Geographical Information, and Manpower

Requirements By Task were all ranked as one of the top seven categories by 50% or more of the experts. The "Sum of Ranking" shows the aggregate demand for each information category, thus representing the relative importance of each category. For instance, Logistic Information received a Sum of Ranking score of 20, which is the second best ranking (lower scores equate to higher priorities). The four highest priority information categories identified in this research are presented in bold type in Table IV. These categories were then evaluated for software availability, as required by investigative question 2.

As will be shown later, the four highest prioritized information categories can be automated on the Z-184 using commercially available software. Therefore, these information categories were selected as the components or modules for the bare base MIS program.

Operational Definitions. With the general information categories identified, the scope of the data contained within each category was then defined. The definitions presented below were developed through informal discussions with the experts and from personal experiences.

Logistic Information: Information pertaining to the surveillance, tracking, and analysis of deployed and on-site resources. This includes Harvest Bare assets, Harvest Eagle assets, Harvest Falcon assets, WRM, local purchase items, and on-site resources (e.g., water).

Airfield Information: Information pertaining to a specific bare base's airfield to include pavement and soil type, layout, dimensions, and on-site aircraft support equipment (i.e., navigation aids, barriers, lighting).

**Geographical Information**: Information pertaining to the local political, religious, economic, cultural, health, and climatological environment.

**Manpower Requirement By Task**: An automated tool which provides personnel requirements for specified bare base tasks. Output includes planning information such as crew size, crew make-up, and estimated man-hours needed for each task.

These definitions formed the basis for the experts to carry out their next tasks of identifying software operating features.

Third Objective. The third task the bare base experts were asked to complete was to identify the software operating features for the final four information categories. This task provided information essential to the software selection and design and assembly phases of this research. Semi-structured telephone interviews were again used in accomplishing this objective. During the interview, the experts were reminded of the four information categories' definitions and were asked to describe how they would use this information if it were automated. Their responses were then divided, by this researcher, into two general categories--essential and non-essential. This provided some leeway in the selection of software and in the design and assembly of the program's modules. Table V presents a consolidated list of the operating features identified by the bare base experts.

Table V

Operating Features For The
Final Four Information Categories

* 1. Display a menu of the software's features

* 2. Generate routine and ad-hoc reports

* 3. Permit user to add/delete/modify data

* 4. Maximize "user friendliness"

* 5. Perform arithmetic functions
(Logistic Information only)

* 6. Track materials and their consumption rate
(Logistic Information only)

* 7. Access/display specified geographical text data
(Geographical Information only)

8. Provide simple graphic displays (pie, bar, line)
(Logistic Information only)

9. Be familiar to AF users (same as or similar to
software currently in use)

10. Provide sorting and manipulation of specific
fields and cells within the data base

11. Support import and export of data from other
software

12. Provide quick initialization and report generation

13. Provide 2-D graphical displays (site plan,
utilities, airfield support equipment, etc)
(Geographical and Airfield Information only)

* Essential Operating Feature

Investigative Question 2

What, if any, commercial software is available that can manage these needed categories of information?

A two-step procedure was used in answering this investigative question. First, software consultants were

interviewed to identify the application software programs that support the essential operating features found in investigative question 1. The interview served as the first cut in the software selection process. Second, literature regarding the most promising software was reviewed to substantiate the findings of the consultants by revealing the full capabilities of the software and determining if it operates effectively on the Z-184. The final software selection had to wait until the AF developed programs could be evaluated against the software operating features and hardware constraints. This was accomplished in response to investigative questions 3 and 4.

Software Consultant Interview. The software consultants shown below were chosen from among Air Force Institute of Technology instructors.

- Lt Col Bruce P. Christensen, Assistant Professor of Logistics Management (10)
- Lt Col James T. Lindsey Jr., Head, Department of Communication and Organizational Sciences (24)
- Lt Col Richard E. Peschke, Head, Department of Quantitative Management (30)
- Lt Col James R. Holt, Assistant Professor of Engineering Management (23)
- Lt Col Richard I. Moore, Assistant Professor of Logistics Management (28)
- Capt Roger L. Davis, Assistant Professor of Systems Management (12)
- Capt James W. Smith, Assistant Professor of Base Level Maintenance Management (36)

These individuals were selected because of their breadth of knowledge and experience regarding commercial and AF developed software. The questions presented in Appendix E were used as the outline for interviewing these individuals.

The first question asked of the consultants was designed to identify the general types of software that would best handle the four information categories. Subsequent questions dealt with identifying specific commercial application or integrated programs that could be used to automate these information categories. A synopsis of the results of these interviews is presented in Table VI.

Table VI

Consultants' Software Recommendations

Logistic Information

| Consultant | General Software Type | Primary Software Recommended: Application Programs | -or- Integrated Programs |
|---|---|---|---|
| Christensen | SS | | Enable™ |
| Lindsey | SS | | Enable |
| Peschke | SS | | Enable |
| Holt | DBASE | dBASE III Plus | |
| Moore | SS | Lotus 123 | |
| Davis | SS | Quattro™ | |
| Smith | DBASE | | Enable |

Legend:
SS = Spreadsheet
DBASE = Data Base
CAD = Computer Aided Design
GP = Graphics Program

Table VI (cont.)

Consultants' Software Recommendations

**Airfield Information**

| Consultant | General Software Type | Primary Software Recommended: Application Programs | -or- Integrated Programs |
|---|---|---|---|
| Christensen | DBASE | | Enable |
| Lindsey | DBASE | | Enable |
| Peschke | DBASE | | Enable |
| Holt | -- | | |
| Moore | GP/CAD | Harvard Graphics™<br>AutoCAD® | |
| Davis | WP | WordPerfect® | |
| Smith | CAD | Cadkey™ | |

**Geographical Information**

| Consultant | General Software Type | Primary Software Recommended: Application Programs | -or- Integrated Programs |
|---|---|---|---|
| Christensen | WP | | Enable |
| Lindsey | DBASE | | Enable |
| Peschke | DBASE | | Enable |
| Holt | DBASE | KnowledgePro® | |
| Moore | WP | WordPerfect | |
| Davis | WP | WordPerfect | |
| Smith | DBASE | | Enable |

**Manpower Requirements by Task**

| Consultant | General Software Type | Primary Software Recommended: Application Programs | -or- Integrated Programs |
|---|---|---|---|
| Christensen | DBASE/SS | | Enable |
| Lindsey | SS | | Enable |
| Peschke | DBASE/SS | | Enable |
| Holt | -- | | |
| Moore | SS | Lotus 123 | |
| Davis | SS | Quattro | |
| Smith | DBASE | | Enable |

Legend:
SS = Spreadsheet
DBASE = Data Base
CAD = Computer Aided Design
GP = Graphics Program

Three of the software consultants recommended that application programs such as dBASE III Plus, Lotus 123, and WordPerfect be developed for each module and then tied together with a simple batch shell program (28, 12, 23). By using these specialized application programs, each module would have access to state-of-the-art software features. The three consultants that selected application programs were either unfamiliar with integrated software programs or felt that they were too complex for use in a contingency environment. The remaining four consultants, however, felt that an integrated program was the best means of automating the four information categories (10, 24, 30, 36). Moreover, all of these consultants selected Enable Version 2.0 as the software they would use.

Enable is an integrated software package consisting of a word processor, spreadsheet, data base manager, graphics generator, and telecommunication program. In general, Enable was chosen by the consultants who were familiar with its capabilities for the following reasons: 1) Enable fulfills all the essential operating features identified by the bare base experts; 2) Enable provides an easy mechanism for transferring data between programs; 3) Enable is already integrated, so that a shell program would not be needed. For these reasons and because Enable was singled out by most of the consultants as best suited to automate the four information categories, a review of literature pertaining to

Enable's hardware and software capability was performed to confirm the consultants' recommendations.

Software Review. Enable was evaluated for Z-184 compatibility and to determine if it could, in fact, support all the essential operating features identified by the bare base experts. During the evaluation, current documentation on Enable was reviewed and hands-on operational tests were performed. Evaluating Enable's hardware interface compatibility was accomplished by first reviewing the documentation to ascertain Enable's hardware requirements and then conducting a performance test to verify that these requirements are compatible with the Z-184. Once the hardware interface question was resolved, an analysis of Enable's ability to meet all the essential operating features was performed.

Enable's User Manual and Spezzano's book entitled Using Enable™, 2nd Edition were reviewed to identify the hardware requirements needed to operate Enable on the Z-184 personal computer. These requirements are listed below.

1. Enable is compatible with IBM PC™, XT™, AT™, Personal System/2™, or 100% compatible computers to include the Zenith Z-180 series PC (38:12, 19:xiii).

2. Enable requires, as a minimum, two 5 1/4 or 3 1/2-inch disk drives or one 5 1/4 or 3 1/2-inch disk drive and a hard disk (38:12). The Z-184 is equipped with the latter of these two configurations.

3. Enable requires a minimum of 320K RAM using MS-DOS(R) (Microsoft Disk Operating System) Version 3.2 or later to operate effectively (38:12, 19:xiii). The Z-184 has 640K RAM and comes with MS-DOS Version 3.2 (35:2-4B).

4. Although there is no 3-D graphic capability in the laptop version of Enable 2.0, simple graphics are available (35:2-4C).

5. Some of the keystrokes for the Z-184 are different from a full sized PC. The HOME, END, PGUP, and PGDN keys must be used in conjunction with a special FN key provided on the Z-180 series computers. For example, to use the END key, the user must hold down the FN key and then press the END key (19:xiii).

6. Enable 2.0/Laptop does not have the menu-generator feature found in the full-sized version of Enable 2.0 (35:2-4C).

Since Enable will work on the Z-184, the question then becomes: Does Enable truly have the power and flexibility to fulfill all the <u>essential</u> operating features shown in Table V? After reviewing the Enable user manual, Spezzano's book <u>Using Enable</u>, and after performing independent tests of Enable features, this researcher was convinced that Enable had the capabilities to satisfy all the essential operating features identified by the bare base experts. The first feature, displaying a menu of operations, cannot be created on Enable/Laptop 2.0. However, menus produced with a non-

laptop version of Enable will operate on the laptop version. This poses no real problem because the architecture/assembly of the actual program would be accomplished prior to deployment. Likewise, the need to modify the program's menus (in contrast to the data) during the first 72 hours of a deployment seems remote. As with any good information retrieval program, Enable permits the user to design standard reports or develop unique reports on an "as needed" basis. It also gives the user full editing control over all records within the data bases. Simple arithmetic operations and graphic displays are easily performed from both the spreadsheet and data base management programs. Enable's global macros and windowing features make the final two essential features of tracking resource consumption rates and accessing and displaying specific information a relatively easy operation.

Investigative Question 3

> **Concerning the specific information within categories, where and in what form is this information available?**

The purpose of this question is to identify the data bases for each information category and determine whether this information was already available in any AF micro-computer based programs. The AF programs identified for each information category were evaluated against the operating features identified by the bare base experts to determine if these programs should be integrated into the bare base MIS

program. Air Force programs not fulfilling these operating features were discarded. Current literature was reviewed to identify not only the AF programs, but also the non-automated data for each information category. As discussed later in this section, none of the AF programs were incorporated into the bare base MIS because they could not fulfill the experts' essential operating features. Once the non-automated information was identified, it was incorporated into the bare base MIS using application software (see investigative question 6). The remainder of this section contains the results from the evaluation of the AF programs. Also, the specific non-automated information used in the bare base MIS's data bases are presented and justified.

Airfield Information. This literature review revealed no AF software containing a collection of unclassified bare base airfield information. In fact, the only comprehensive collection of bare base airfield data was found in Capt Chal Martin's 1984 thesis, An Information Manual to Support Base Engineer Emergency Force (Prime BEEF) Team Deployment to Egypt or the Arabian Peninsula. Capt Martin extracted site specific airfield information from numerous navigation charts and Department of Defence (DoD) flight information publications (24). Martin's report contains the following airfield information.

- Airfield Location
- Principal Users
- Number of Runways
- Length of Runways
- Runway Elevation
- Local Relief
- Surrounding Vegetation
- Nearby Large Cities

Although this information is not as comprehensive as the bare base experts would have liked, it does provide the essential airfield data needed to demonstrate a functional bare base MIS.

In addition to the real information obtained from Martin's thesis, fictional information such as airfield support equipment, local soil and pavement types, and runway dimensions was added to the Airfield Information data base to demonstrate how such information would be automated and used in the field (the information added to Martin's research is not accurate and should be replaced with real data when this program is put into operation). The following Egyptian airfields were selected from Martin's manual to serve as the data base for the Airfield Information Module:

Primary Airfield

- Aswan

Alternate Airfields

- Ras Gharib
- Ras Shukhayr
- El Minya
- Asyut
- Wadi Abu Shihat
- Hurghada
- New Valley
- Luxor
- Bir Abu Rahal
- Daraw
- Ras Banas
- Abu Simbel

For demonstration purposes, Aswan was selected as the primary airfield, with the other air bases in its vicinity serving as alternate airfields. Appendix F lists the report forms and a representative sample of the information found in the Airfield Information Module.

Geographical Information. Capt Martin's thesis proved once again to be the most comprehensive collection of bare base regional and site specific geographical information. Other sources were either too general or were not assembled in a useful manner. Presently, Martin's thesis serves as a source of information for CENTAF planners (the AF's bare base planning office) and has been incorporated into the Readiness Planning Course at the Air Force Institute of Technology, Wright-Patterson AFB (52, 51). Martin's thesis contains all the essential information identified by the bare base experts as part of investigative question 1. The regional and specific geographical information for Aswan air base was also accessed by this module. Appendix G contains excerpts of the information found in the Geographical Information Module.

Manpower Requirements By Task. Research into this information category revealed a bare base planning program written by Capt Michael Cooley and Msgt Ralph Nolan of USAFE/DEXD and adapted by Mr. Michael Doggett for AFIT's School of Civil Engineering (14). This program was written in COBOL and was designed for Civil Engineering's Work Information Management System (WIMS). Although this program does provide some manpower requirements information (i.e., number of facilities and support equipment needed to beddown a bare base of 50 or more people), it does not satisfy enough of the operating features required by the bare base experts to be a viable alternative. For example, it does not provide

the essential elements of typical crew sizes and required man-hours for contingency tasks. Similarly, it does not permit the users to customize the data base to site specific requirements. Finally, this manpower requirements program would require extensive reprogramming to make it operate on the Zenith Z-184.

A non-automated source of manpower requirements information was also obtained from AFIT's School of Civil Engineering. This planning document, called simply "Labor and Time Estimates", was assembled from various regulations, publications, and interviews with key personnel. It consists of a brief description of some forty-seven tasks and the optimal crew size to perform these tasks, and the estimated man-hours for each task. Many of these tasks involve the assembly of various Harvest Bear and Harvest Eagle assets. This document contains information that is ideally suited for the bare base MIS. Therefore, it was incorporated into the Manpower Requirements By Task Module. Portions of the Manpower Requirements By Task Module's data base are reproduced in Appendix H.

Logistics Information. During the literature review, two particular items relating to automated resource management were identified--the Harvest Eagle Inventory Management System and the Integrated Combat Harvest Asset Management System.

Harvest Eagle Inventory Management System.

Recognizing the need to automate the in-garrison management of Harvest Eagle assets, AFLMC/LGX, Gunter AFS, developed two phases of the planned three-phased Harvest Eagle Inventory Management System (HEIMS) (34:144). HEIMS is "a series of COBOL programs designed to automate the management of Harvest Eagle assets and to improve the deployment and reconstitution of those assets" (34:VIII). HEIMS is designed around TAC's 1987 concept of Harvest Eagle operations (34:1-1). Maj Rickards, HEIMS Project Manager, stated that the overall focus of HEIMS is to help base level managers control the inventory within the Harvest Eagle kits (33). In the past, inventory control was conducted using 3 by 5 inch cards--a cumbersome and time-consuming endeavor (33).

During the conception phase of the project, higher headquarters "identified the need to work the Harvest Eagle automation project in phases" (34:144). "The initial phase produced the [basic] HEIMS . . . [while] the second phase exploited the new information capabilities created by the HEIMS" (42:144). After completing phase I, phase II modified the basic program to better meet the user's needs.

User feedback generated during phase II resulted in several reports being developed by HEIMS that could possibly aid the deployed CE field commander (33). These reports give the CE field commander a detailed list of all Harvest Eagle resources by specific pallet.

HEIMS will run on either the Zenith Z-248 or the portable Zenith Z-184 (33). Preliminary investigation revealed the bare base CE commander could take the entire HEIMS software program and data base with him to the field. However, while in the field the commander would have to sort through many reports not pertaining to his scenario before finding the information he needs. The time required for such a task is typically not available in a contingency environment. Although HEIMS was designed for CONUS bases to enhance management of their Harvest Eagle assets, several features of HEIMS can also be applied in helping the CE field commander during initial bare base operations. Because of HEIMS' potential, a hands-on analysis of HEIMS was conducted to determine if it meets the bare base experts' essential operating features.

Evaluation of HEIMS. A copy of the HEIMS software and its accompanying user's manual was obtained from Gunter AFS to facilitate the evaluation process. Each of the pre-identified operating features was evaluated by simultaneously reviewing the user's manual and running the HEIMS program.

The material tracking features built into HEIMS are outstanding. After building the initial deployment package, the user can access the deployment data base and track the location of individual pallets, boxes, and items within a particular box. The user also has the option of searching for individual items by noun, bin location, NSN (National

Stock Number), or SIN (abbreviated stock number). The bare base CE commander should find the tracking features within HEIMS an essential tool.

HEIMS allows the user to update the data base as individual items are depleted, an ability which is valuable for determining current material status. However, HEIMS does not give the user the ability to track consumption rates. One positive feature within HEIMS, related to consumption, is the Critical Quantity Function. This is a built-in report that highlights the available quantity of items designated as critical by the user. The Critical Quantity Function is useful for monitoring items such as generators, light sets, and other essential items.

The manipulation of the data base, to include site specific items, is another useful tool built into HEIMS. Adding unique items to the data base through HEIMS is possible but on a restricted basis. As written, the program will allow the user to add items, but each item added must have a SIN and NSN number. There is a subroutine within HEIMS that requires the NSN to match already established numbers.

HEIMS is designed to be user friendly. For the purposes of this evaluation, "user friendly" is defined as a program that is easy for the novice to use and is not cumbersome for the trained day-to-day operator. HEIMS meets both extremes. On-screen directions are clearly written and very helpful to

the novice user. The program is also driven by single function keys (F1 through F10). This feature is very convenient for the day-to-day user and allows quick access to specific reports. After spending some time with the user's manual and testing the HEIMS program, this researcher is confident that any CE staff member, regardless of field experience, could run the program efficiently and effectively.

Several standard reports are built into the HEIMS program. They range from the Critical Materials report to the Packaging report of individual boxes. Along with printing these standard reports, the user also has the option of printing an individual screen while running HEIMS. There are over 190 different screens a user may see while running HEIMS. Each screen contains different information and could be used as a report by itself. HEIMS allows the user to be fairly specific in the amount and type of information to be assembled, but the information must be printed within the report format already established. The user cannot create his own report format. Additionally, all the reports generated by HEIMS require a 14-inch printer. Although 14-inch printers are readily available within the DoD, they are quite bulky compared to compact printers, which use 8½ X 11 inch paper. A compact printer would be better adaptable to mobility and field conditions.

Up to this point, only those features that could, with minor modifications, fulfill the experts' design operating criteria were presented. Major drawbacks of HEIMS with regard to CE support on field operations are as follows:

1. HEIMS has no option for interfacing with other computer software programs. This restricts HEIMS from sharing information with other modules, a limitation which does not satisfy the minimum requirement of a true management information system. Additionally, it prevents the future expansion of the bare base MIS program to link up with other field computers (e.g., computers used by Services and Supply squadrons).

2. HEIMS does not perform arithmetic calculations to indicate percent of inventory available, total quantities consumed, etc. These features are necessary for field CE commanders to get an accurate and complete assessment of their logistical status.

3. HEIMS has no graphic presentation capabilities. Graphics are important when reporting resource status or other summary data to high headquarters in a complete and useful form.

4. Since HEIMS was developed for base Supply, it is not familiar to CE personnel. It is vital for the users of any program be familiar with its capabilities prior to relying on it during a deployment.

5. Certain functions in HEIMS take a considerable amount of time to operate. This is acceptable in an office setting, but is not acceptable in a contingency scenario.

6. HEIMS has limited ad-hoc report capability. If the CE commander has to create reports by hand because a logistics program cannot supply them, then the program will quickly be abandoned. Such would be the case with HEIMS.

Although HEIMS has made great strides in bringing an automated bare base resource management program to reality, it falls well short of fulfilling the essential logistics management operating features and therefore was not incorporated into the bare base MIS program.

Integrated Combat Harvest Assets Management System.

The Integrated Combat Harvest Assets Management System (IC-HAMS) is the second AF program evaluated for the Logistics Information Module. Although this program is not scheduled to be completed until September of 1988, it appears that the IC-HAMS, when complete, will be more orientated to the CE field commander's resource management needs than HEIMS (20). According to Mr. John H. Green, Chief of the War Readiness Branch, HQ TAC, IC-HAMS will be "designed for field deployments, not just for in-garrison operations" (20).

Some of the key features of IC-HAMS, as described by Mr. Green, are listed below:

1. Designed for use on microcomputers.

2. Interfaces with Supply system's computer.

3. Generates pre-designed and ad-hoc reports which can be saved as a separate data base or sent to the screen or printer.

4. Tracks inventory items as they are expended.

5. Organizes inventory by Unit Type Codes. A UTC is a alphanumeric code that uniquely identifies each type unit of the Armed Forces and is used to assign units to specific operation plans (43:54).

6. Provides multiple layers of information for each inventory item.

Each of these features will aid the CE field commander, but one of the most interesting is item 5--Organizes inventory by UTCs. Combining this UTC organization with the ability to create ad-hoc reports allows the user to generate a site-specific deployment data bases (20). For example, when a unit deploys, the IC-HAMS operator generates a logistics support list by UTC. Each item actually deployed will be coded "D" for "deployed" and have a "geolog" code indicating its specific location. Once in the field, all inventory items in the data base with a deployment status of "D," and the "geolog" code corresponding to the bare base site of interest will comprise the new data base for the field commander. Creating this "field commander data base" opens the door to all types of computer management applications for the CE commander.

Although IC-HAMS shows great potential, it cannot be evaluated until it is fully developed. Based on preliminary research, this program is projected to meet most of the experts' operating features and warrants further investigation when completed.

Logistics Information Data Base. Because HEIMS and IC-HAMS were eliminated from consideration for the bare base MIS for the reasons described above, the Logistics Information Module was developed with an application program using logistics information from Bright Star '87 exercise. Bright Star '87 relied on a broad range of resources including Harvest Bear, Harvest Eagle, and on-site assets. The resources from this exercise are well suited to demonstrate most of the aspects of the Logistics Information Module. Some of the fields of information used in the HEIMS program were added to the Bright Star '87's data. All the information in this data base is only representative of the actual resources used on a Southwest Asian bare base deployment. Appendix I contains the specific data and the reports from the Logistics Information Module.

Investigative Question 4

> **Of the information identified in investigative question 3 that is already programmed for computers, what programming languages were used and what hardware and software are required to run the programs?**

The purpose of this investigative question was to evaluate the acceptable AF programs identified in

investigative question 3 for compatibility with the Zenith Z-184 and the other application software needed to automate the remaining information categories. Although three AF programs were identified in question 3 (WIMS's Manpower Requirements Program, HEIMS, and IC-HAMS), none could support all the essential operating features identified by the bare base experts. Therefore, no further evaluation was needed. Similarly, Enable, the application program chosen by the software consultants, is a completely integrated program that requires no interfacing research.

Investigative Question 5

**What computer user interface features will provide CE commanders with the information they need in an easy-to-use format?**

This investigative question was posed in order to identify some of the essential user interface design features and to incorporate a minimum of four of these features into the bare base MIS program. A review of current literature regarding software design was conducted to ascertain some of the more common user interface features. Once these features were identified, they were evaluated and prioritized so that the top four features could be incorporated into the bare base MIS program. The top four user interface features were selected based on a frequency count of the software consultants' responses. Table VII contains the user

interface design features identified in the literature review and presented to the software consultants.

Table VII

User Interface Design Features

- Contains standard procedures (37:297).
- Displays necessary guidance information (37:297).
- Contains consistent display format (37:298).
- Displays a distinctive cursor (37:300).
- Contains clear data labels (37:300).
- Highlights critical user guidance (37:300).
- Contains consistent wording convention (6:313).
- Communicate with user in user's vernacular (6:313).
- Speaks directly to users in active voice (37:303).
- Indicates status of operation (6:313).
- Contains single selection menus (37:231).
- Contains key stroke menu selection (37:233).
- Displays feedback for menu selection (37:234).
- Contains consistent data display format (37:238).
- Allows user to use upper or lower case (37:236).
- Has logical order of options within a menu (37:239).
- Returns to higher-level menu (37:244).
- Is easy to learn (15:1).
- Minimizes memory load on user (37:295).
- Contains task-oriented help screens (37:330).

The results of the frequency count analysis revealed that the following design features were deemed the four most important by the software consultants and therefore should be included into the bare base MIS program:

1. Contains consistent wording convention (6:313)
2. Indicates status of operation (6:313)
3. Returns to higher-level menu (37:244)
4. Contains task-oriented help (37:330)

Enable Version 2.0 takes advantage of each of these four features and passes them on to the software designer through its menu-generator option. The menu-generator allows the designer to create menu-driven applications from the Enable

system--applications that according to Dr. Spezzano, "can be so easy to use that the operator doesn't even have to know Enable" (38:165). Enable's menu-generator allows the designer to display operating status for each application; it returns the user to the previous menu by simply pressing the ESC key; and it provides for an on-line help screen for each application. The consistency of the wording is the designer's responsibility to insure. Overall, Enable has the ability to provide the essential user interface features required by the software consultants.

Investigative Question 6

> **By synthesizing commercial and Air Force software, how can an integrated program be developed to provide the categories of information needed by the bare base CE commander?**

The purpose of this investigative question was to assimilate the results the previous five questions into an integrated management information system for the bare base CE commander. This program will hereafter be referred to as the Bare Base Management Information System or BBMIS. The BBMIS program is intended to be used by Prime BEEF teams assigned a bare base deployment tasking. It should be modified by each base to meet their specific informational needs and incorporated into their home station training. The ultimate goal of the BBMIS program is to provide the field CE commander with essential logistics, airfield, geographic, and

contingency task planning information needed to beddown a bare base in the most efficient manner possible.

For the remainder of this thesis, the person using the BBMIS program will be referred to as either the user or operator.

Assembly Precepts

The precepts listed below were identified prior to assembling the BBMIS program in order to define how it would be put into operation.

1. The program will be incorporated into home station training by using an unclassified simulated data base.

2. The classified information for the actual bare base location will be maintained, in accordance with TEMPEST regulations, in a format compatible with the unclassified data base. The classified data base will be structured so that it can be added to the unclassified data base when deployed.

3. The BBMIS program was designed to allow users with little or no experience with Enable to operate its basic features. Simple data base editing instructions have been incorporated into the program to assist these users. Additionally, more advanced features such as sorting specific data, producing graphs, and generating ad-hoc reports can be accomplished by operators with a working knowledge of Enable.

4. Bare base mobility plans, which are updated annually by CENTAF, will be incorporated into this program. This

program is intended to augment the paper copies of the war plans and not replace them as the primary source of planning information.

5. The Z-184 laptop and an approved micro-printer will be added to the Prime BEEF deployment team kit.

These precepts, along with the design criteria and user interface features identified in answering investigative questions 1 and 5 respectively, were the driving factors behind the assembly of this integrated program.

Bare Base Management Information System

The Bare Base Management Information System is a menu driven, tenant program which uses Enable Version 2.0 as its host. In general, the only time it is necessary to use Enable's features directly is when adding to a data base, generating ad-hoc reports, or graphically displaying specific information, activities that are not essential in the first 72 hours after deployment. In most cases, the operator need only respond to the options listed on each of the twenty-seven different menus. The operator simply moves the light bar to the option he/she wishes to select and presses ENTER (the selection can also be made by pressing the first letter or number of the option of interest).

The infrastructure of the BBMIS is generic in nature, allowing it to be customized to any bare base site throughout the world. However, for illustration purposes, this program was tailored for a Prime BEEF team assigned to Aswan

Airfield, Egypt. Therefore, regional information pertaining to Southwest Asia, country information pertaining to Egypt, and location information on Aswan Airfield have been loaded into the Geographical Information Module. The Airfield Information Module consists of airfield data for Aswan and twelve of the surrounding air bases. The Logistical Information Module contains the actual resources used during Bright Star '87. Since this exercise was conducted in the middle east, it is likely that the resources would be similar to those actually committed to Aswan Airfield. Finally, the tasks and associated man-hours used in the Manpower Requirements Module are typical assignments that would be normally be accomplished at any contingency site.

Although the BBMIS program generates reports from several of Enable's Database Management System (DBMS) data bases, information needs only to be entered or modified once for all the reports to be updated. For example, if new airfield resources arrive on site, the operator only has to update one data base for the items to appear in the appropriate Logistics Information and Airfield Information reports.

A list of the files making up the BBMIS program are provided in Appendix J for future research or program maintenance purposes.

Starting The Program

The Bare Base Management Information System is initialized by typing "BBMIS" from the A:\ prompt. This batch file (bbmis.bat) loads Enable and bring the BBMIS program on-line. Enable must be residing in a subdirectory on the C drive called C:\ENABLE. After the program is initialized, a welcome screen is displayed which provides the operator with a brief description of the program, some background information, and the source of data for the BBMIS program. It is recommended that first time users read the entire welcome screen because it also contains important instructions on how to use the BBMIS program. These instructions (shown below) are applicable throughout the BBMIS program except were noted otherwise.

1. Press ESC to return to the previous menu.
2. Press SHIFT/F10 to re-enter BBMIS program after running any reports.
3. Press F1 for help or more information.
4. Press SHIFT or CTRL keys to re-light the screen. This is needed quite often because the Z-184 conserves energy by dimming the screen after only two minutes of non-use.

After reviewing the welcome screen, the operator must press ENTER to call up the BBMIS main menu (Figure 1). Experienced users can skip the welcome screen by pressing ENTER immediately.

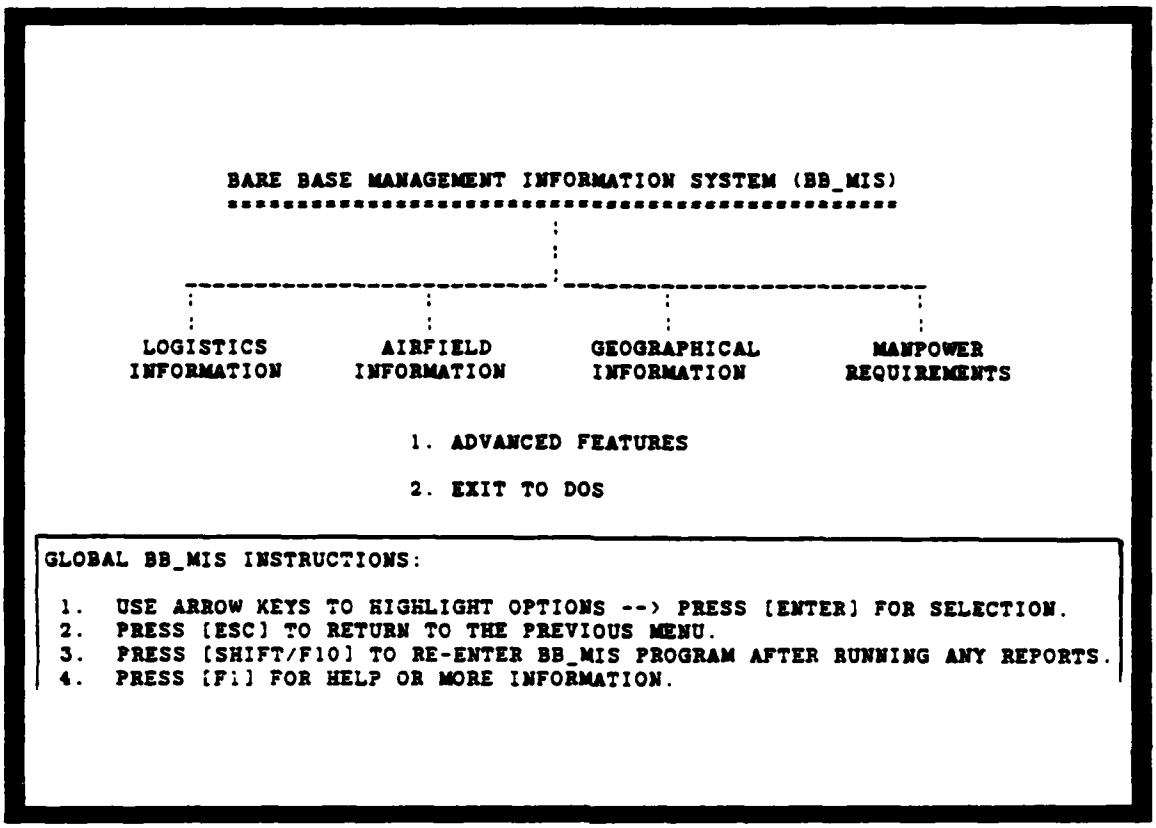



Figure 1. BBMIS Main Menu

From this menu the operator may enter any of the program's four modules (Logistics Information, Airfield Information, Geographical Information, or Manpower Requirements) or select the Advanced Features or Exit to DOS options. The remainder of this section will discuss, in detail, the structure and reports for each module and describe how to use the Advanced Feature option. To help guide the discussion, an organizational flow chart is presented for each module.

Logistics Information Module

Structure. The chart in Figure 2 illustrates how the Logistics Information Module is organized.

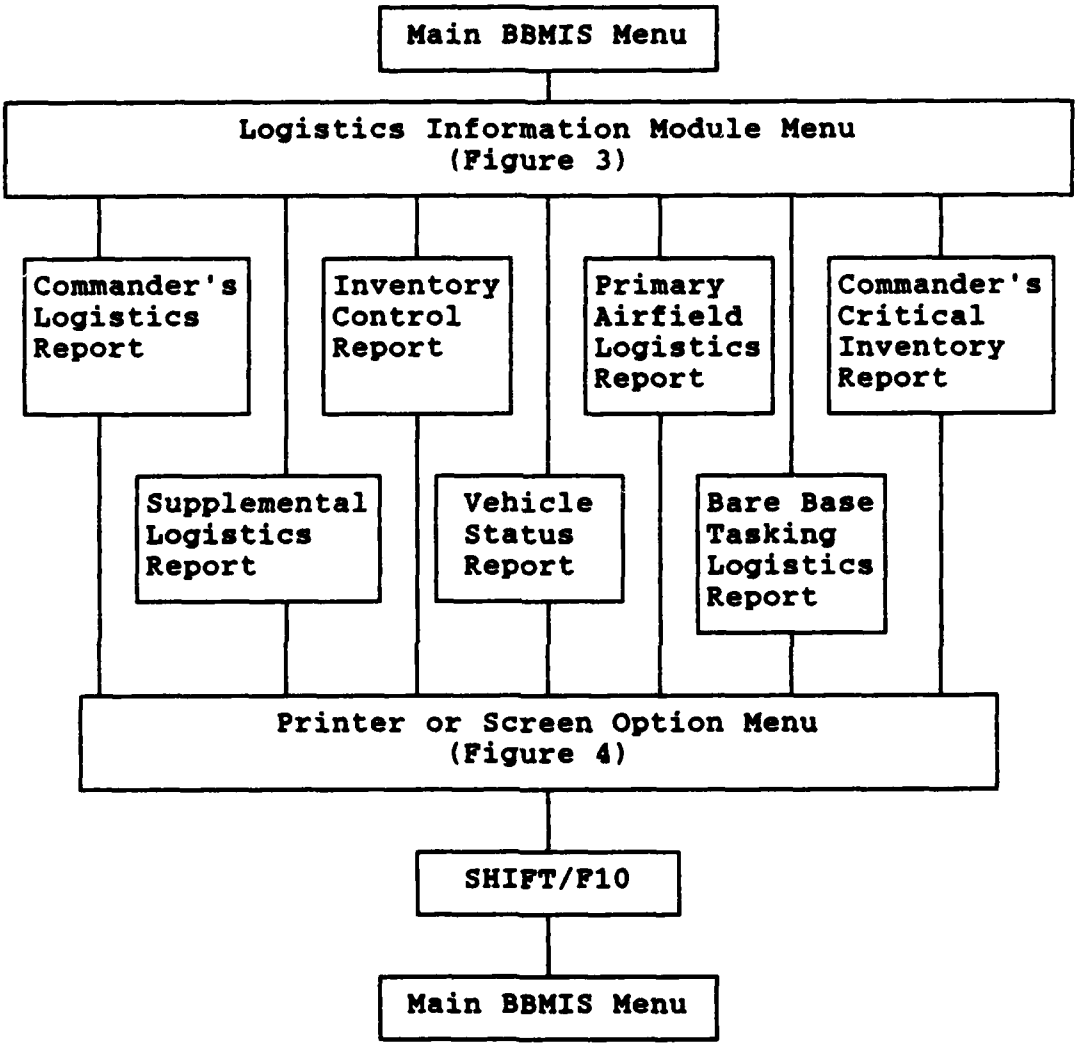



Figure 2. Logistics Information Module Organization

Upon selecting the Logistics Information option from the main BBMIS menu, the Logistics Information main menu shown in Figure 3 is displayed.

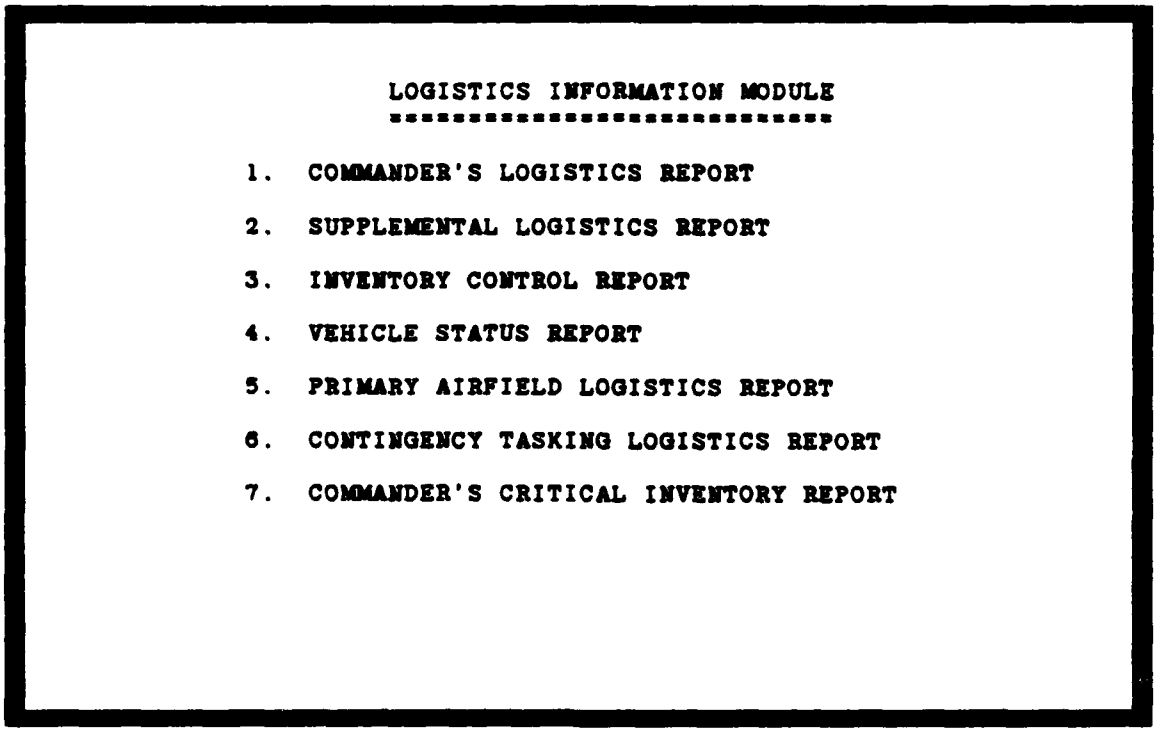



Figure 3. Logistics Information Main Menu

This menu allows the operator to select from seven pre-defined reports designed to aid the CE commander in managing his resources while in the field. When one of these reports is selected, a menu which gives the user the choice of sending the report to the screen or printer, is displayed (Figure 4). The Printer or Screen Option Menu is used throughout the BBMIS program. A unique aspect of this menu is that it is called to the screen by a macro (indicated by the "mac" on the status line at the bottom of the screen) rather than another menu, and therefore, the operator cannot back out of this menu by pressing ESC.

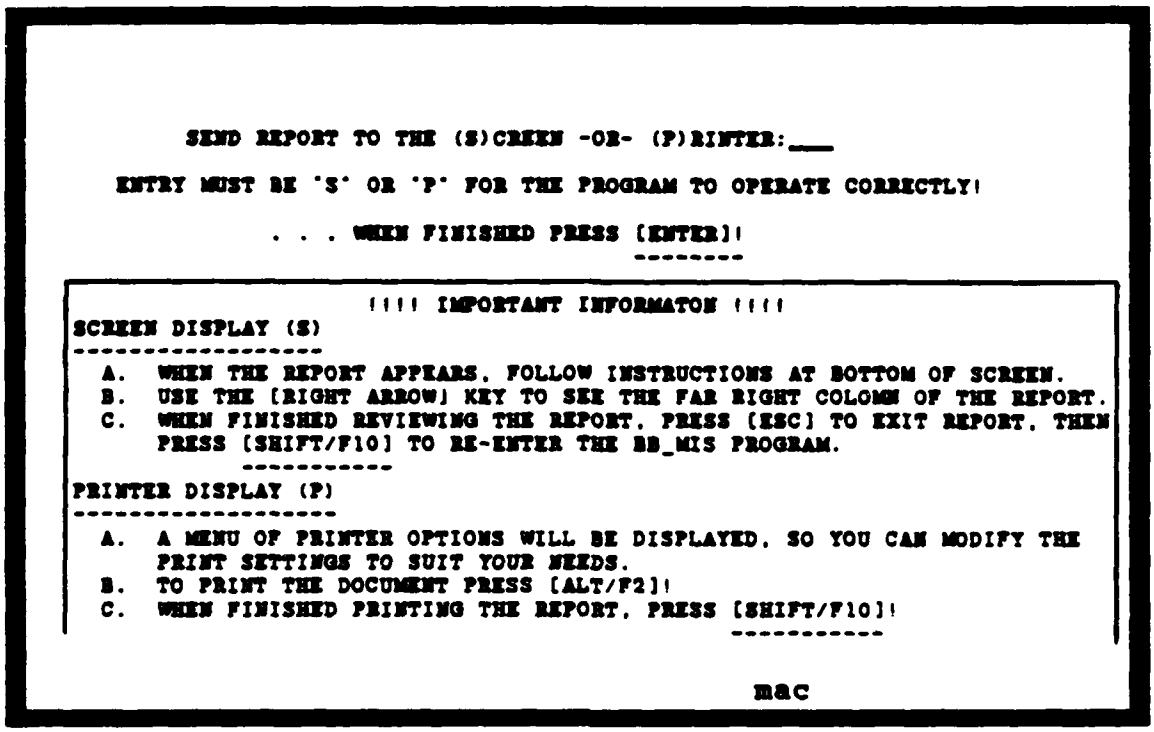



Figure 4. Print or Screen Option Menu

A "P" or "S" (upper or lower case) must be entered at the menu prompt for this feature to operate correctly. If anything other than a "P" or a "S" is entered, or if the user wishes to cancel the operation, he/she must press ENTER to start the frozen macro, CTRL/BREAK to cancel macro operations, and SHIFT/F10 to re-enter the BBMIS program. If a printed copy of the report is desired, the user will enter a "P" at the menu prompt; "P" brings a printer adjustment menu to the screen. This menu allows the operator to make final printer adjustments prior to printing. When the operator is ready to print the report, he/she must insure the printer is ready and press ALT/F2.

Once the report has been sent to the printer or the screen, the operator has in essence exited the BBMIS program into Enable. The operator must then press SHIFT/F10 to re-enter the BBMIS program.

Reports. The Logistics Information data base consists of 16 fields of information. All of these fields are represented in the logistics reports shown in Appendix I. Additionally, a complete list and descriptions of the fields making up the Logistics Information data base are presented in Appendix K.

Each of the reports from this module were assembled so as to provide the CE field commander with a logical and complete picture of different aspects of his/her resource status. It should be noted that all of the reports in the BBMIS were designed to fit the constraints of a standard carriage return printer.

Commander's Logistics Report. The Commander's Logistics Report provides CE commanders with a quick look at a description of their resources, the quantities on-hand (available) and on-site (in use or consumed), and the items they have classified as "critical."

Supplemental Commander's Logistics Report. The Supplemental Commander's Logistics Report gives the field CE commander a more detailed look at his/her inventory. This report includes stock numbers, abbreviated stock numbers (SIN), nouns (one or two word descriptor), inventory status,

and an indication of whether the items are committed to support a specific task (on or off the airfield).

Inventory Control Report. The Inventory Control Report was devised to augment the Commander's reports and will be primarily used by the commander's logistician. The unique elements of this report include the unit cost of each inventory item, the number of the pallet and box the item was scheduled to arrive in, the source of the item (i.e., Harvest Assets, Prime BEEF team kit, WRM), the BIN location, and specific remarks about each item.

Vehicle Status Report. The Vehicle Status Report provides the bare base CE commander with a comprehensive look at all the available vehicles and their maintenance condition.

Airfield Logistics Report. The Airfield Logistics Report summarizes the essential information for resources committed to support flight-line operations. This report is the Commander's Logistics Report for airfield support inventory items only.

Logistics Report By Contingency Tasks. The Logistics Report by Contingency Tasks is similar to the Airfield Logistics Report except that it compiles logistics information on resources committed to specific contingency tasks only.

Commander's Critical Inventory Report. The Commander's Critical Inventory Report tracks and highlights

those inventory items that the field CE commander deems critical to the bare base beddown mission. This report is also in the same format as the Commander's Logistics Report, but displays only those items coded as critical.

Airfield Information Module

Structure. The following flow chart (Figure 5) of the Airfield Information Module is provided to illustrate how this module is organized.

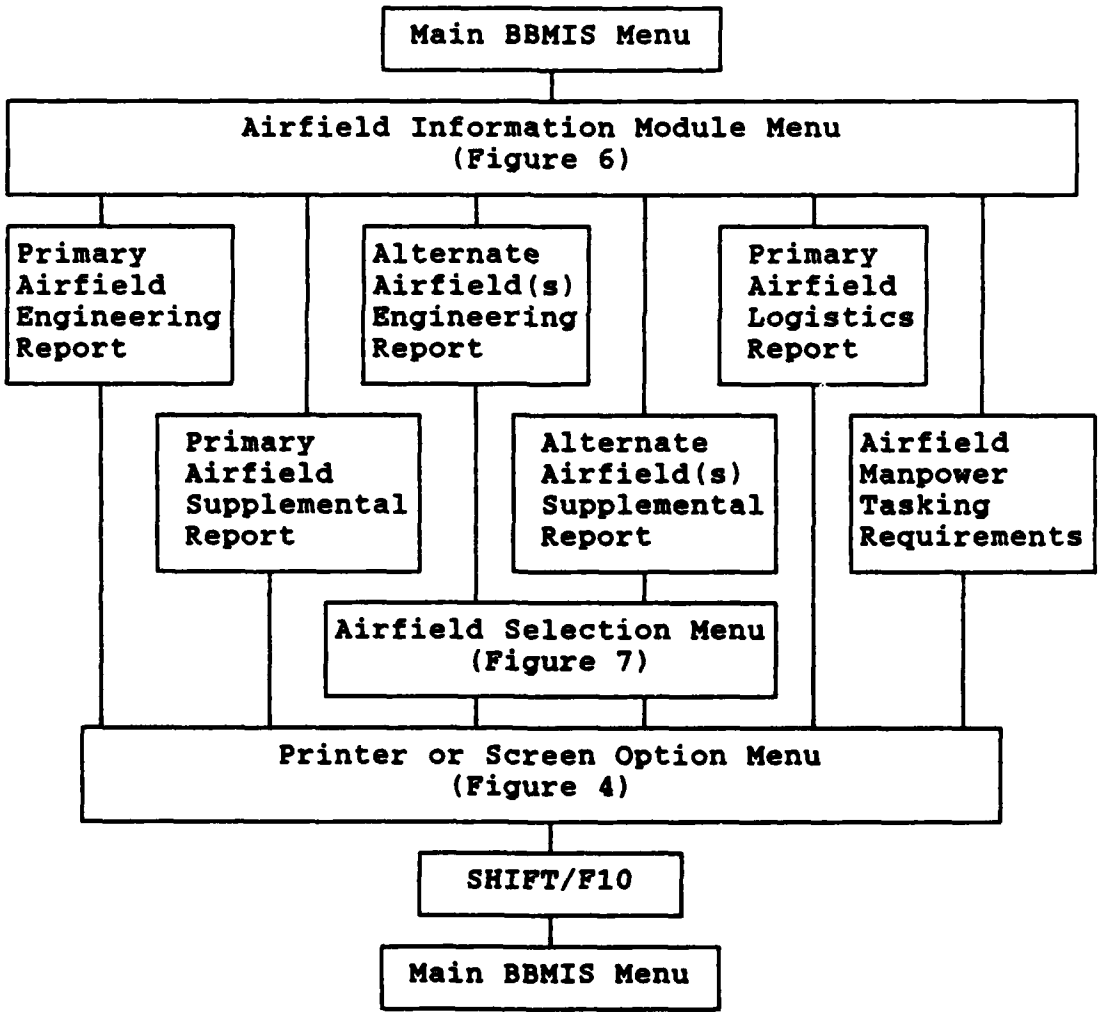



Figure 5. Airfield Information Module Organization

The Airfield Information Module Menu, shown in Figure 6, will be brought to the screen once this option is selected from the main BBMIS menu.

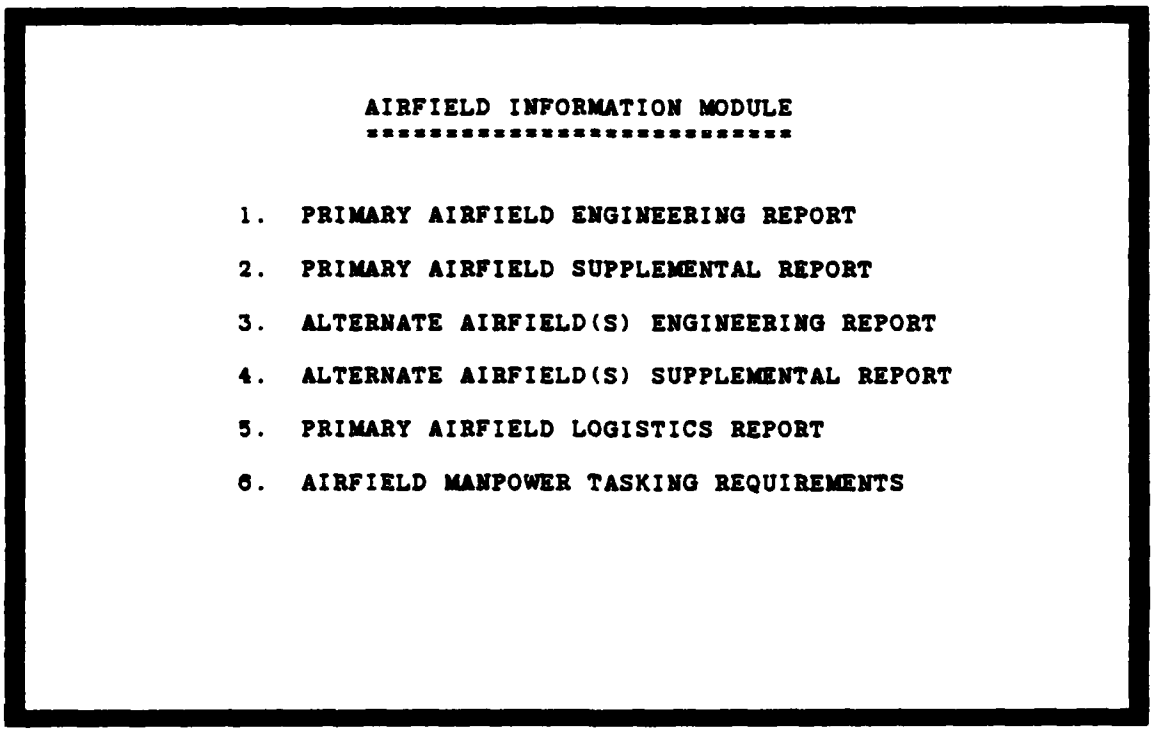



Figure 6. Airfield Information Main Menu

The option selection procedure for this menu is similar to the Logistics Information Module. Once an airfield report is selected, the user will be given the option of sending the report to the screen or printer via the Printer or Screen Option menu (Figure 4). However, if the user selects one of the alternate airfield reports (Option 3 or 4), an intermediate menu (shown in Figure 7) will be displayed prior to the Printer or Screen Option Menu.

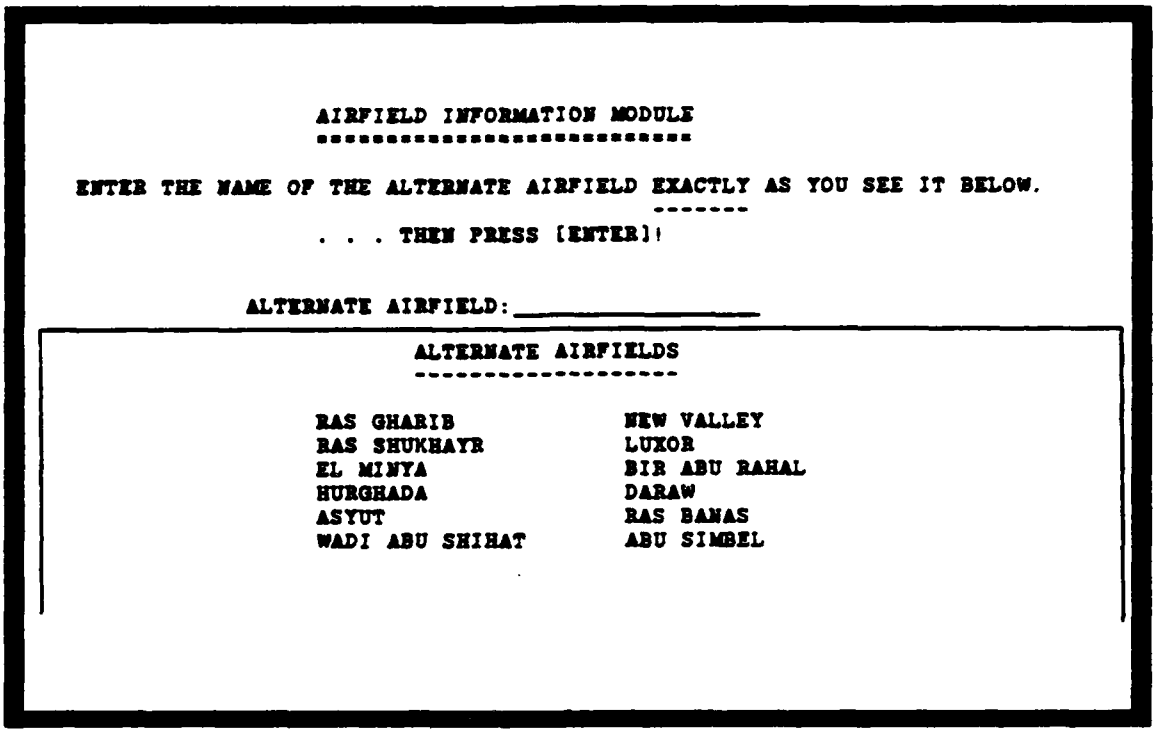



Figure 7. Alternate Airfield Selection Menu

This menu allows the operator to choose the alternate airfield for which he/she desires a report. After entering the name of the alternate airfield, the Printer or Screen Option Menu will again be displayed.

As in the case of the Logistics Information Module, once the report has been sent to the printer or the screen, the user must press SHIFT/F10 to re-enter the BBMIS program.

Reports. The Airfield Information data base is also made up of 16 data fields, which are described in Appendix K. The reports produced by this module try to capture all the essential and immediate information concerning the primary airfield (deployed location) and twelve alternate airfields

in the vicinity of the primary airfield. Samples of the Airfield Information Module's reports are presented in Appendix F.

Primary Airfield Engineering & Supplemental Reports. The Primary Airfield Engineering and Supplemental Reports give the field commander a comprehensive look at the status of the primary airfield. The Engineering Report consists of the following data fields: runway length, runway width, shoulder type, pavement surface, runway heading, base material type, existing airfield components, and general comments. The Supplemental Report provides the engineer with secondary information regarding the airfield, including airfield coordinates, elevation, principal users, population and location of the nearest city, local vegetation, local relief (aircraft hazards), and general comments.

Alternate Airfield Engineering & Supplemental Reports. The format of these reports is identical to the Primary Airfield Engineering and Supplemental Reports. The only difference is the reports consist of the information on the alternate airfield selected.

Primary Airfield Logistics Report. The Primary Airfield Logistics Report is the same report described in the Logistics Information Module. It is repeated here for the operator's convenience.

Airfield Manpower Tasking Requirements. The Airfield Manpower Tasking Requirement displays the planning

information for typical airfield tasks. This report includes such information as task description, crew makeup, crew sizes, and man-hours for typical airfield tasks. The format of this report will be discussed in more detail in the Manpower Requirements By Tasks Module section of this chapter.

## Geographical Information Module

Structure. The organization of the Geographical Information Module is depicted by the flow chart shown in Figure 9 on the next page. Selecting the Geographical Information option at the main BBMIS menu will move the user to the Geographical Information Menu presented in Figure 8 below.

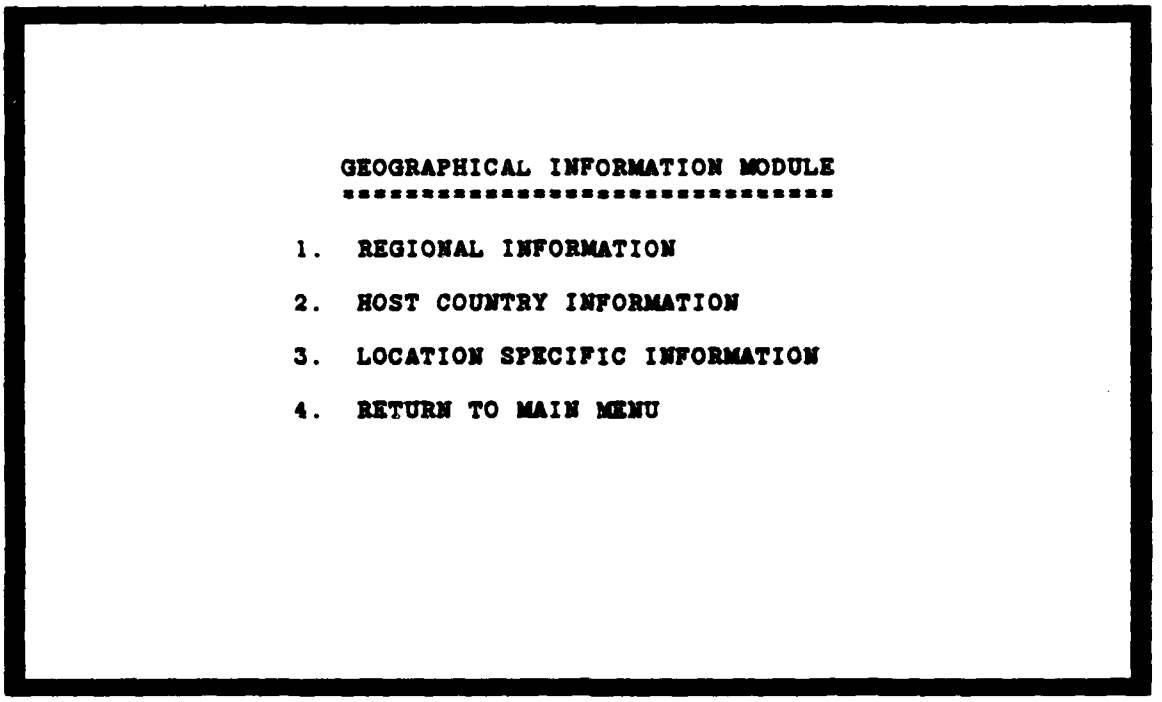



Figure 8. Geographical Information Main Menu

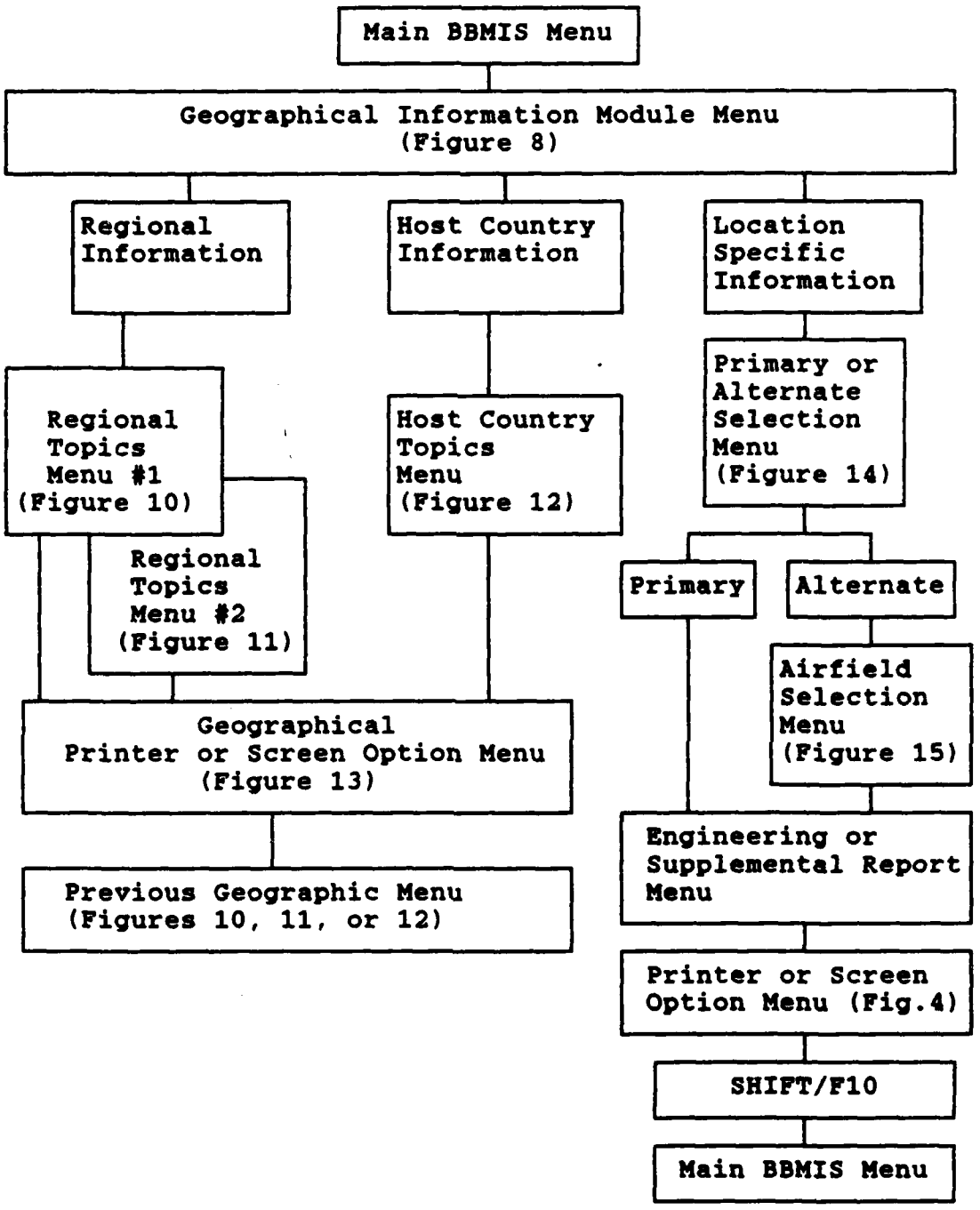



Figure 9. Geographical Information Module Organization

This menu allows the operator to choose between three levels of geographical information--regional, host country,

or location specific. The Regional and Host country options activate a second level menu which presents specific topics for each category. Regional topics are divided between two menus. The first regional menu is shown in Figure 10.

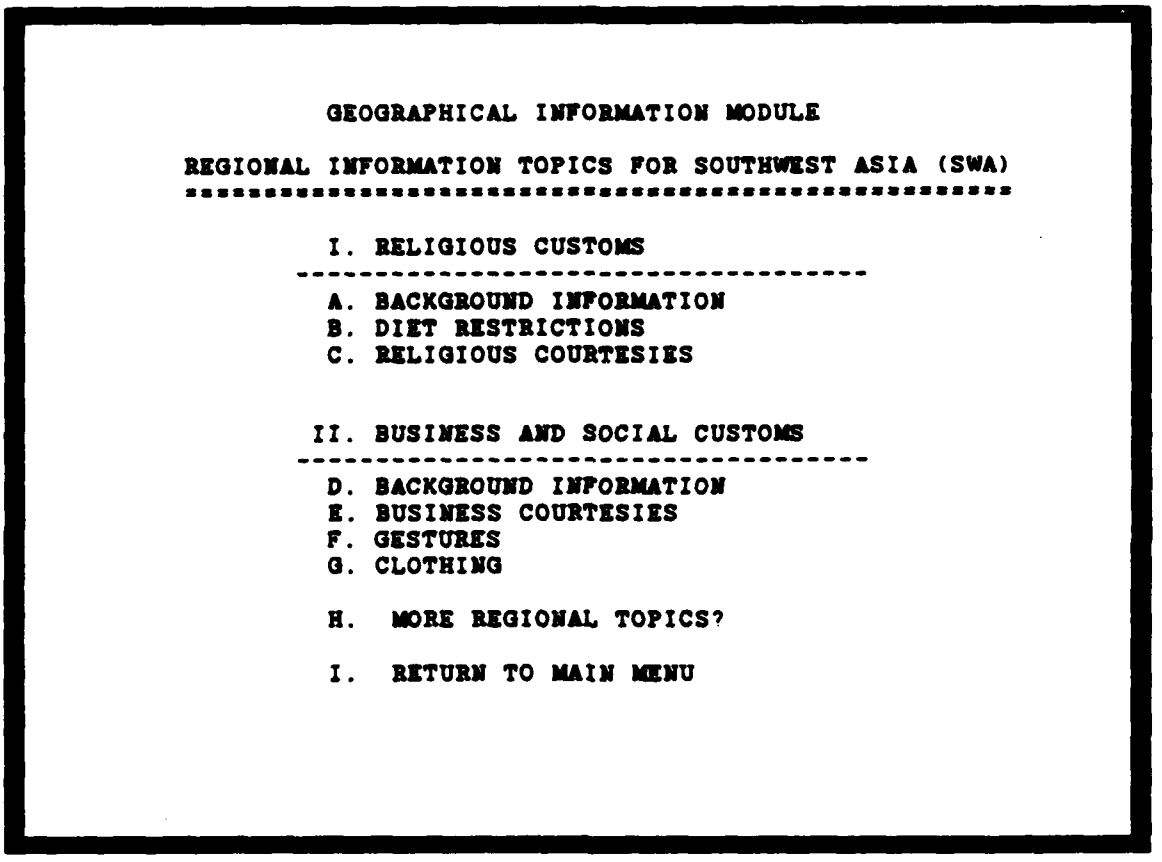



Figure 10. Regional Topics - Screen 1

Additional regional topics can be displayed by selecting the "H. More Regional Topics?" option from this menu. This option displays a second menu (Figure 11) listing the remaining regional topics.

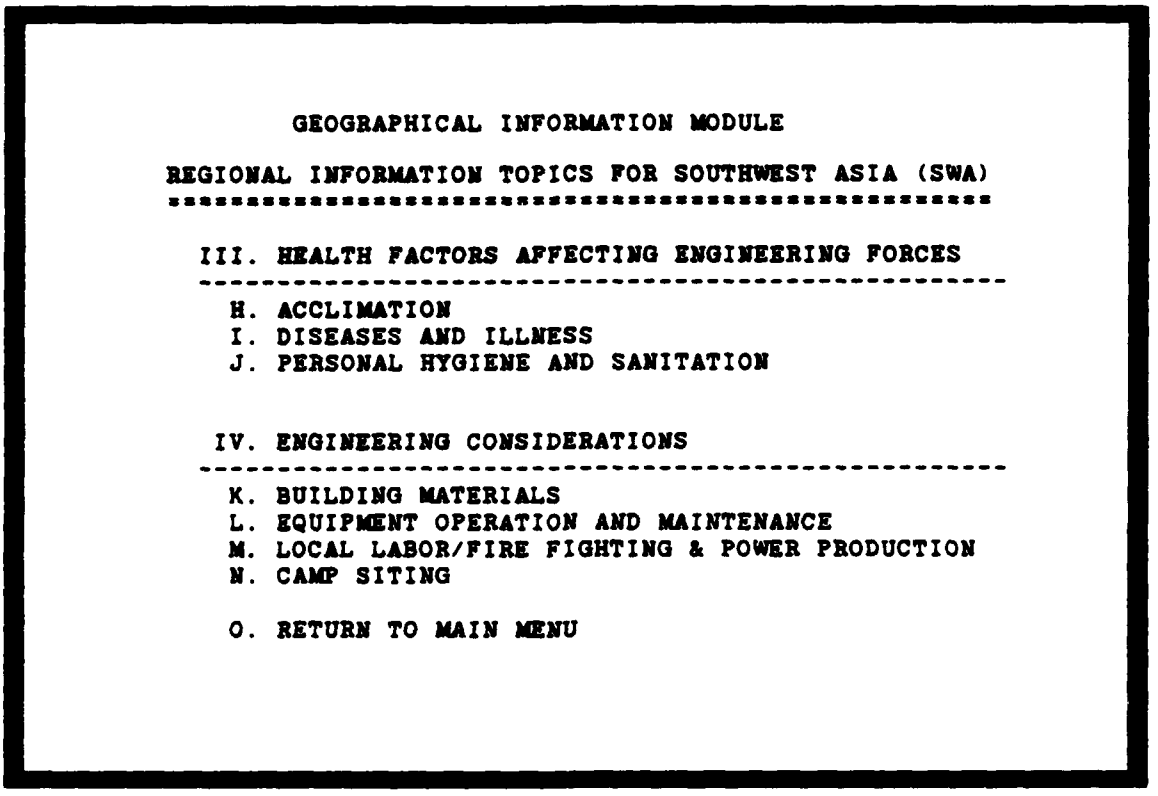



Figure 11. Regional Topics - Screen 2

If the operator wishes host country information, he/she will select option "2. Host Country Information" from the Geographical Information Main Menu. This selection activates the Host Country Topics Menu shown in Figure 12. Upon selecting one of the regional or host country topics, the menu shown in Figure 13 will be displayed to allow the user to send the report to the screen or printer. Unlike the Printer or Screen Option Menu (Figure 4), this menu does not bring up a printer option menu. The operator must use the program's default word processing printer setting.

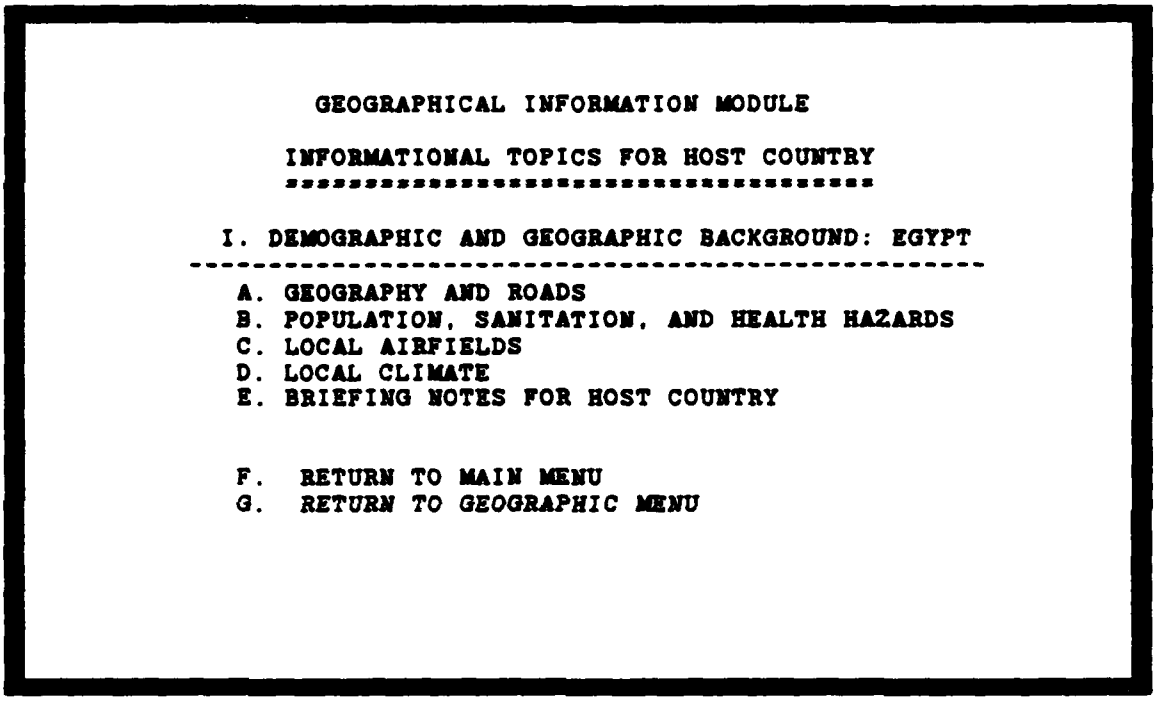



Figure 12. Host Country Topics

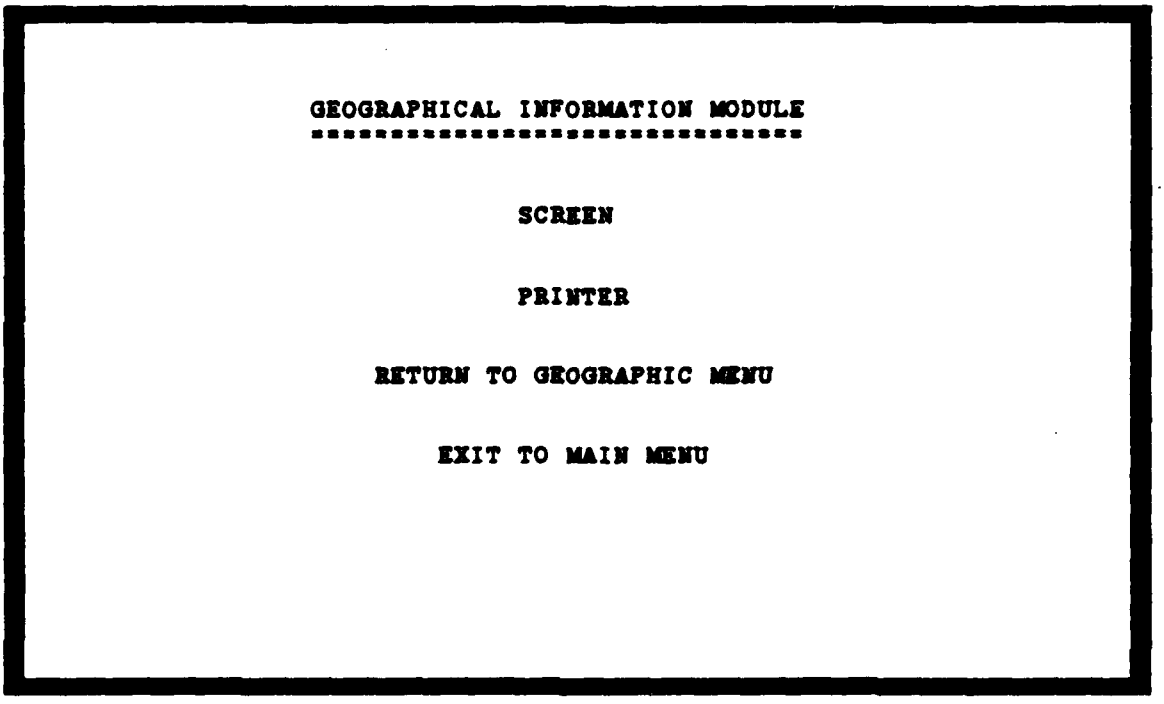



Figure 13. Geographical Printer or Screen Option Menu

However, unlike the Printer or Screen Option Menu, the user can back out of this menu by pressing ESC. If the user chooses the screen option, the next screen displayed will be the report itself. After reviewing the report on the screen, the user simply presses ESC to return to the Geographical menu from which he/she started. If the printer option is selected, the user will be returned to the previous Geographical menu while the report is printing.

The third option on the Geographical Information Main Menu (Figure 9) is Location Specific Information. By selecting this option, the user will access information from the Airfield Information Module data base. Therefore, the user is given the option of accessing information on the primary or an alternate airfield through the menu shown in Figure 14.

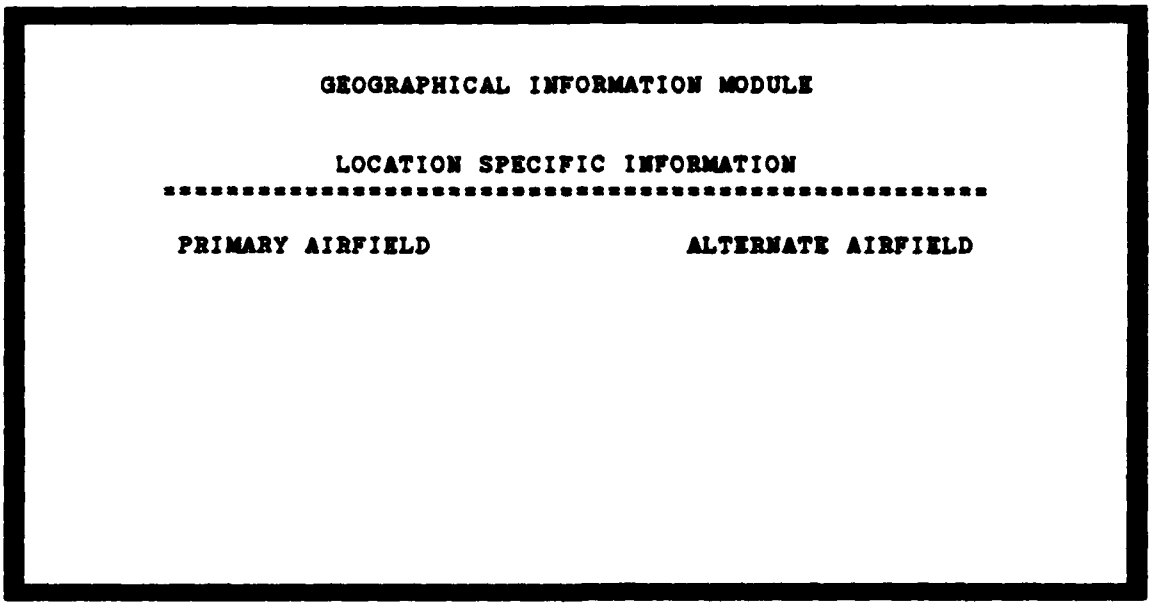



Figure 14. Primary or Alternate Airfield Selection Menu

If the user selects the Primary Airfield option, he/she will be given the choice of selecting the Engineering or Supplemental reports via the menu shown in Figure 15.

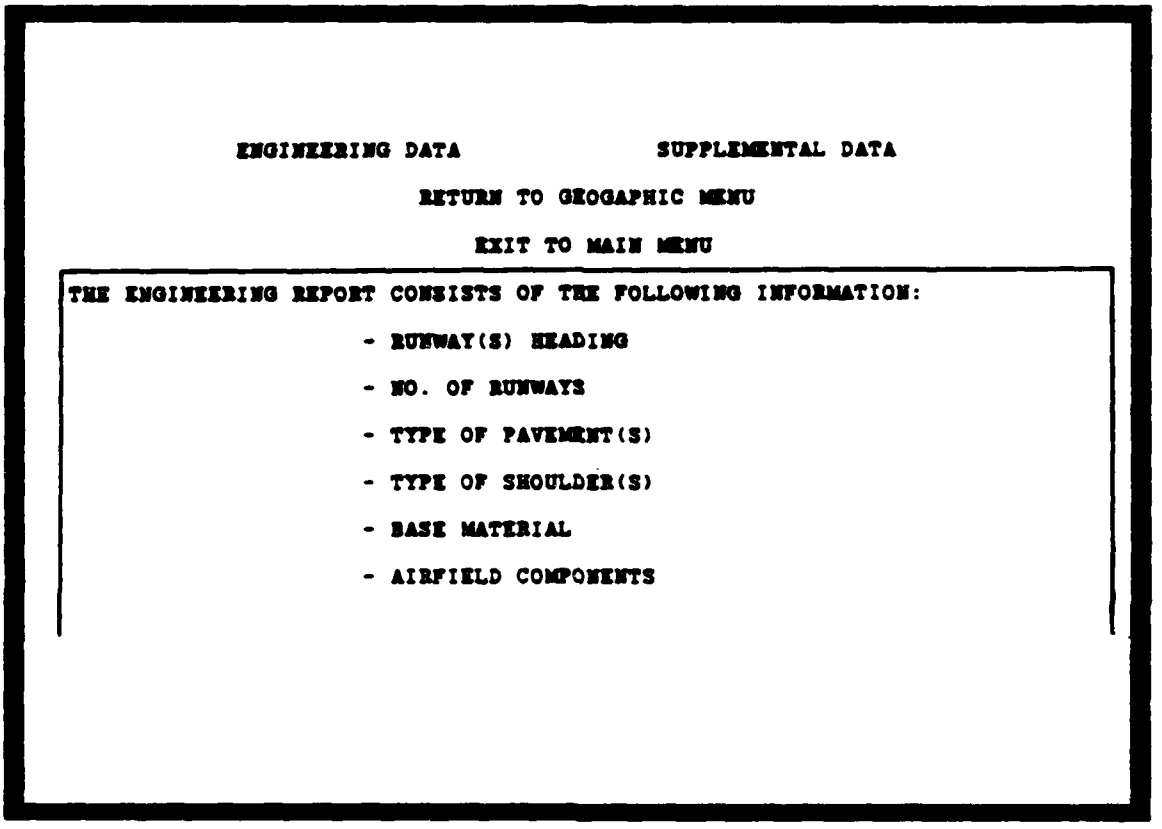



Figure 15. Engineering or Supplemental Report Selection Menu

After making this choice, the operator will again be given the option of sending the report to the screen or printer by the Printer or Screen Option Menu (Figure 4). As stated above, whenever this menu is displayed, the operator must press SHIFT/F10 to re-enter the BBMIS program.

If the user chooses the Alternate Airfield option from the Primary or Alternate Selection Menu (Figure 14) an Alternate Airfield Selection Menu, similar to the one used in the Airfield Information Module (Figure 7), will be displayed. The user will be requested to enter the name of the alternate airfield of interest in the space provided. The Engineering or Supplemental Report Menu (Figure 15) is again called to the screen to allow the operator to select a report. After making a selection, the user can send the report to the screen or printer via the Printer or Screen Option Menu (Figure 4).

Reports. The reports produced by the Geographical Information Module consist of 19 word processor text files and the Airfield Information Module's Engineering and Supplemental Reports. Examples of these reports are provided in Appendix G.

## Manpower Requirement By Task Module

Structure. The flow chart shown in Figure 16 is representative of how the Manpower Requirements By Task Module is organized.

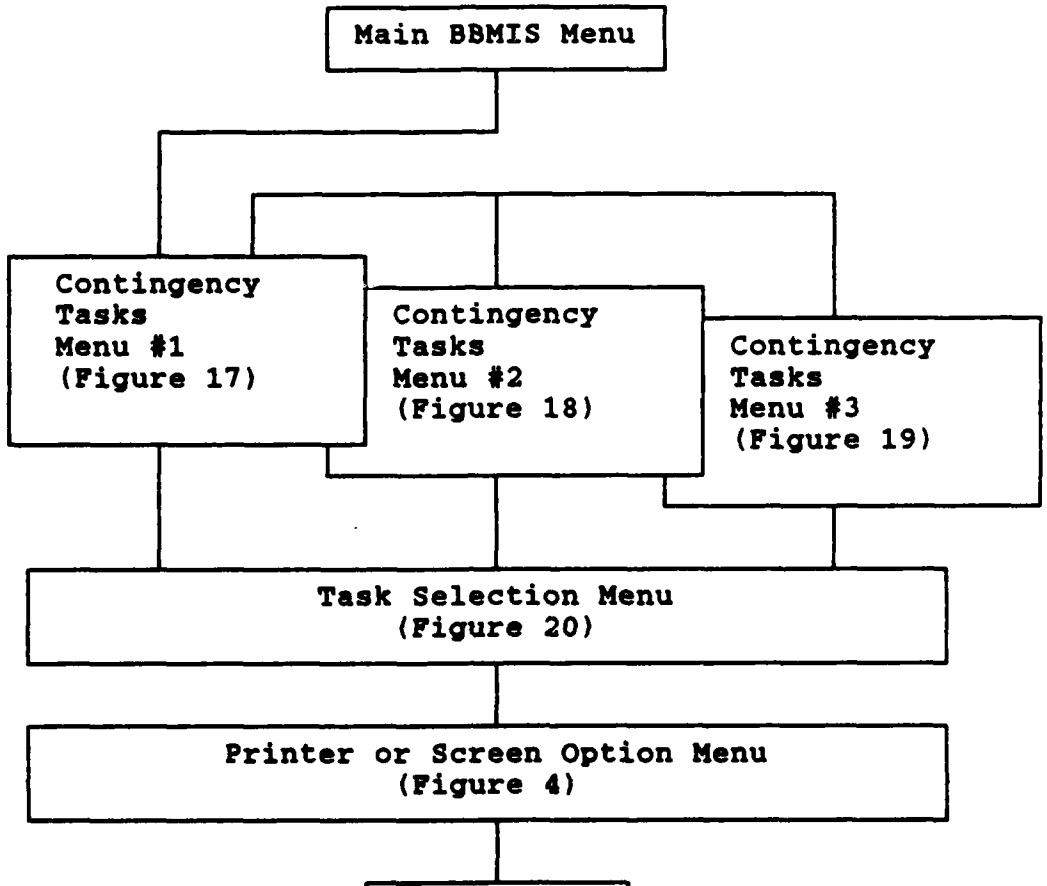



Figure 16. Manpower Requirements By Task Module Organization

The Contingency Task Menu #1, shown in Figure 17, can be accessed from the main BBMIS menu. From this menu, users may choose to generate a report on one of the tasks listed on this menu or call up either Contingency Tasks Menu #2 (Figure 18) or Contingency Tasks Menu #3 (Figure 19).

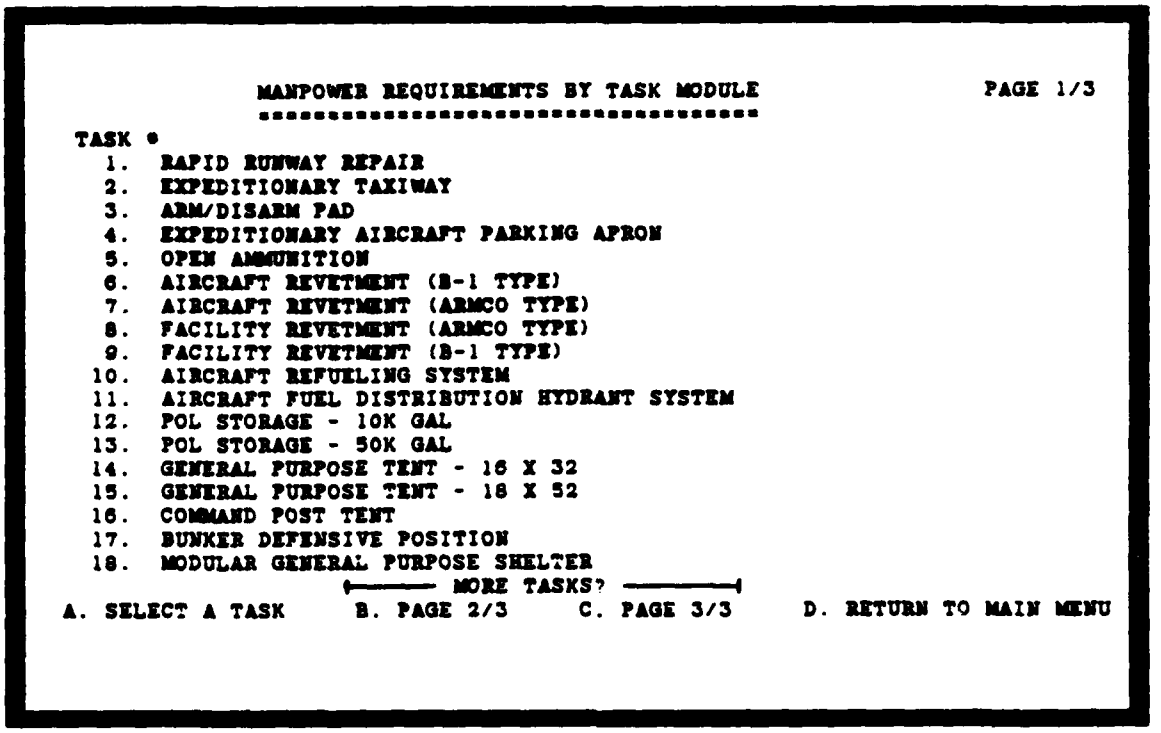



Figure 17. Contingency Tasks Menu #1

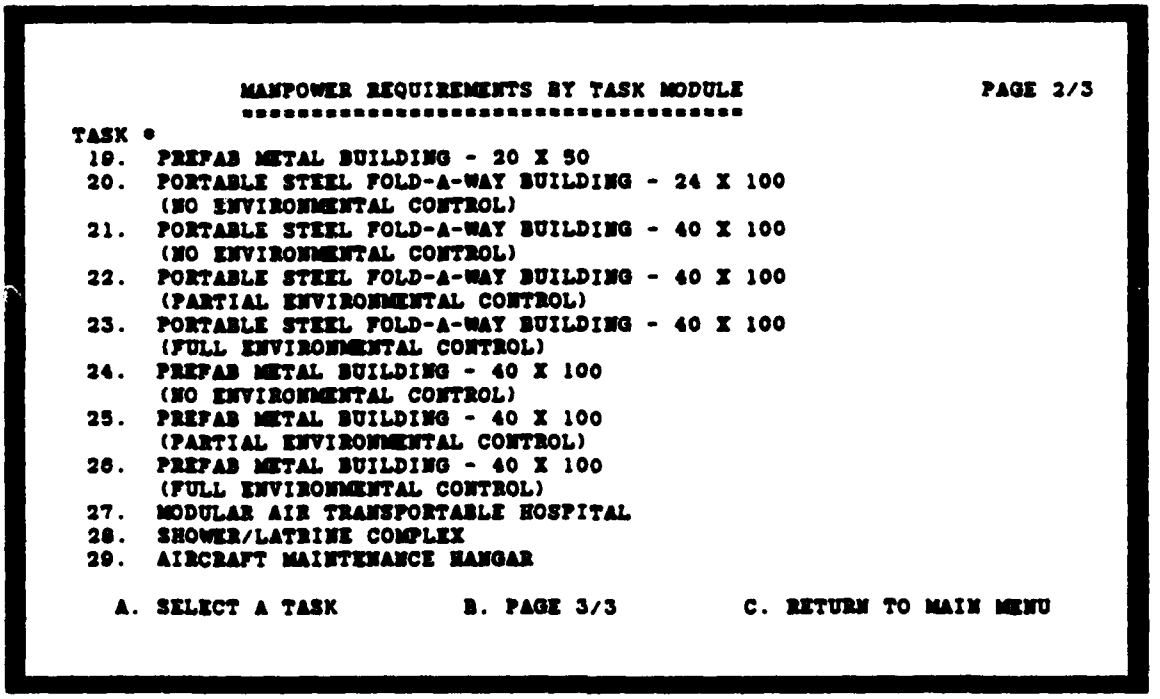



Figure 18. Contingency Tasks Menu #2

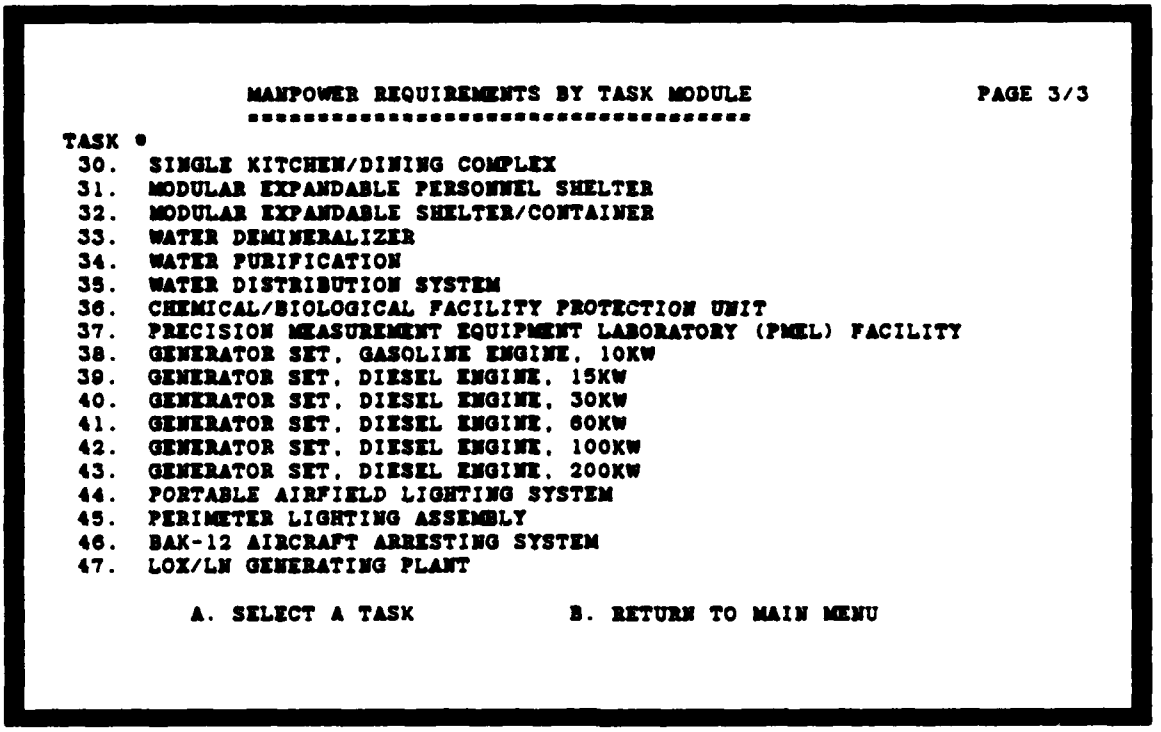



Figure 19. *Contingency* Tasks Menu #3

The operator can move freely between all three menus by pressing ESC to back up one menu or choose one of the options at the bottom of the menu. Once the operator decides what task he/she wants a report on, he/she chooses the "Select a Task" option which moves the user to the Task Selection Menu shown in Figure 20. The Task Selection Menu requests the user to enter the number of the task he/she is interested in. If the users forget the task number, they need only press F1 to display a help screen with the task listing. After the user enters the task number, the Printer or Screen Option Menu (Figure 4) will be displayed. Once the operator has finished reviewing the report on the screen or has sent the

report to the printer, he/she must press SHIFT/F10 to re-enter the BBMIS program.

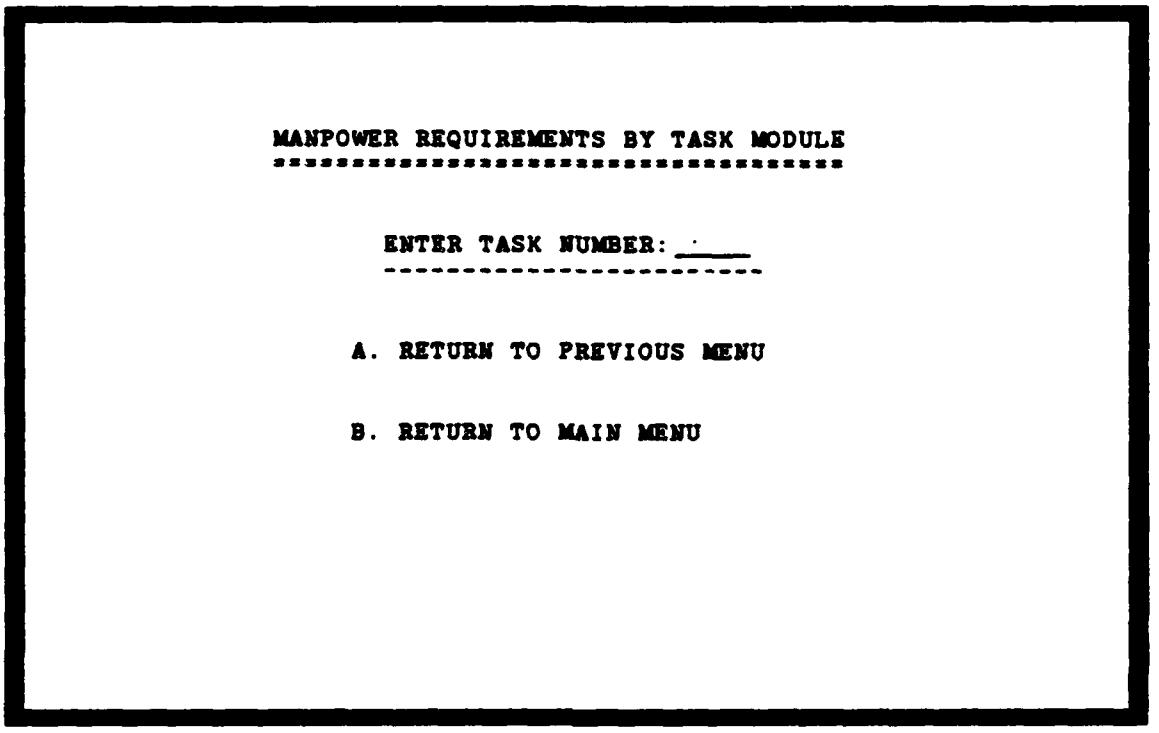



Figure 20. Task Selection Menu

Report. The reports generated from this module contain information needed by the bare base CE commander to plan for various contingency tasks. The Manpower Requirements By Task data base consists of the following information on each of forty-seven different contingency tasks:

1. General task description
2. Sub-tasks

3. Optimal crew type(s) for each sub-task
4. Optimal crew size(s) for each sub-task
5. Number of man-hours for each sub-task
6. General comments
7. Source to the planning data

A typical Manpower Requirements By Task report can be found in Appendix H, and a list of the fields making up this report is presented in Appendix K.

Advanced Features

The Advanced Feature option can be accessed from the main BBMIS menu and is one of the most important features of this program. It is important because it allows the experienced operator to use all the other features Enable Version 2.0 has to offer. It should be pointed out that the Advanced Features option should only be used after the operator has gained a working knowledge of Enable. Once this option is selected, the Advanced Features Menu shown in Figure 21 will be displayed. The Database Management and Word Processing options provide the user an avenue for editing or adding to both the Database Management System and Word Processing data bases which comprise the BBMIS program. The Database Management option takes the user to Enable's DBMS Interact Menu shown in Figure 22.

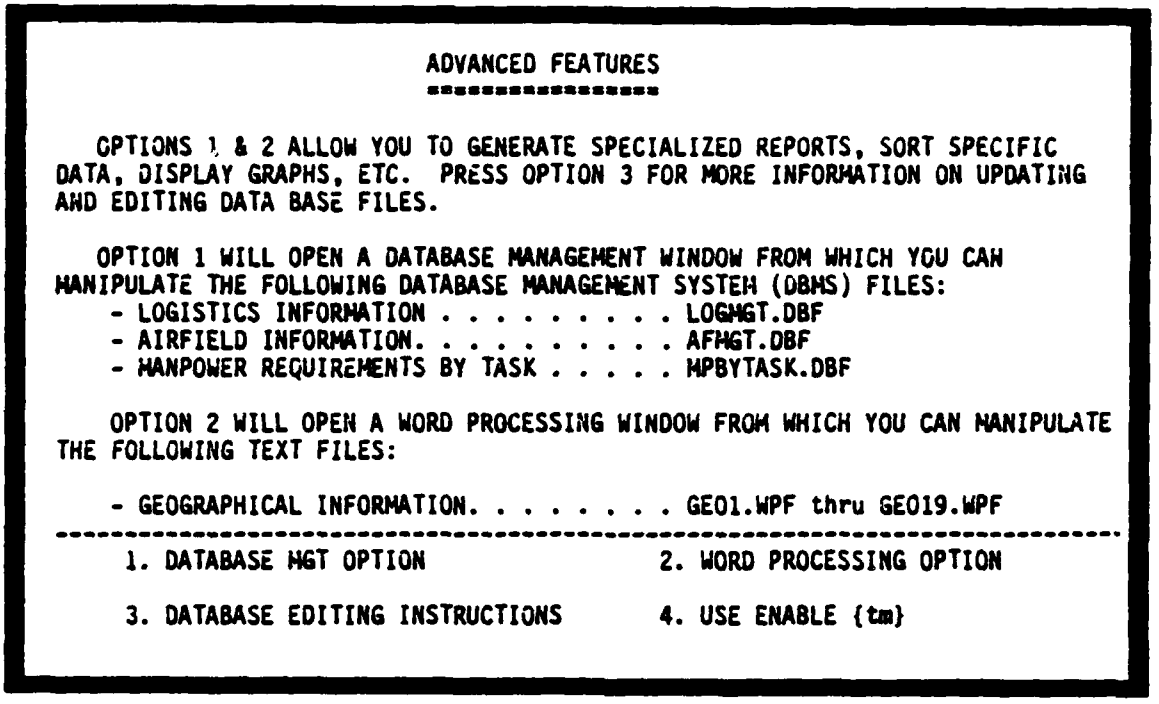



**Figure 21. Advanced Features Menu**

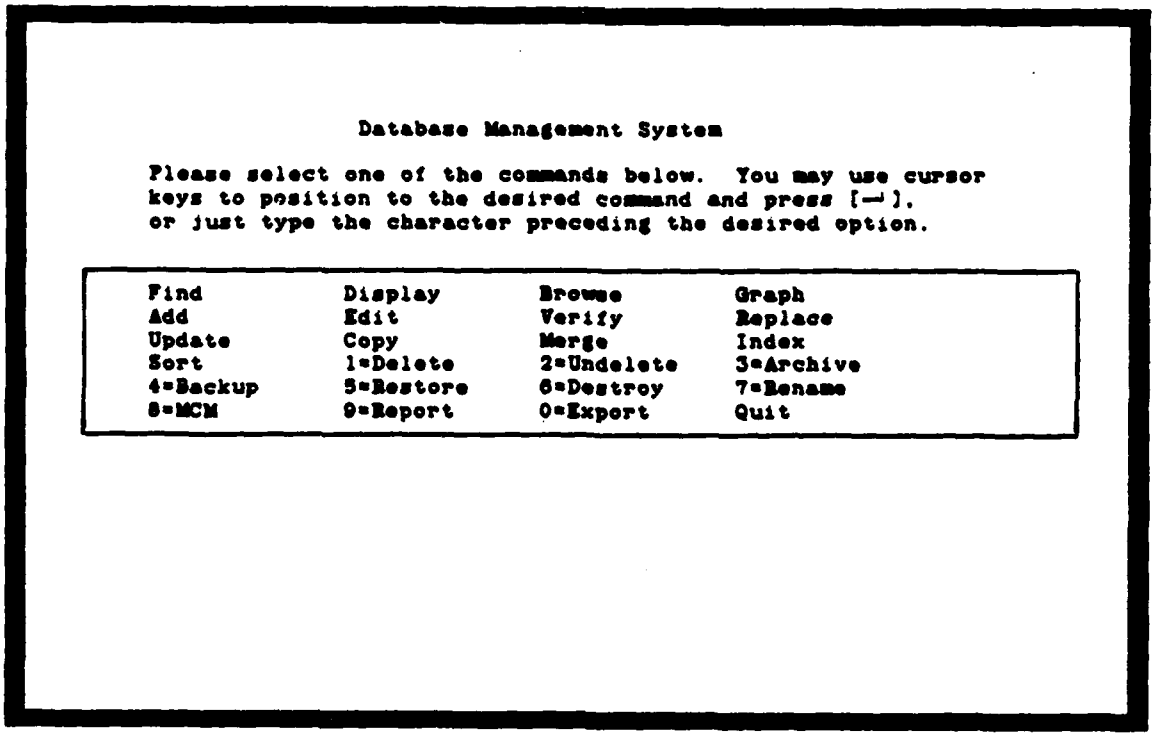



**Figure 22. Enable DBMS Interact Menu**

This menu gives operators the freedom to generate specialized (ad-hoc) reports as they are needed, display graphs of any suitable data, sort on any of the fields from the DBMS data bases, or any of the other features they feel comfortable using. The Word Processing options take users to Enable's Word Processing program, were they can edit any of the geographical text files or create files of their own. Due to limited disk file capacity, it is recommended that if any new files are created they should not be stored on the disk holding the BBMIS program. If the total number of files on the BBMIS disk exceeds 112, an operating error will result.

All of Enable's other features can be accessed through the Use Enable option, which simply takes the user to Enable's main menu.

When the operator has finished with the Advanced Features option he/she must press SHIFT/F10 to re-enter the BBMIS program. Users can also exit directly from Enable if they so choose. The Advanced Features' options were intentionally left open-ended to allow the program to adapt and to expand with the experience level of the operator. The Advanced Features' option will become more important after the initial 72 hour beddown period this program was designed for.

Field Test Procedure

The field testing procedure consisted of having two groups of individuals, with varying degrees of familiarity with personal computers, evaluate the BBMIS program on its structure and content.

The first group was comprised of the following members of the 2750th Civil Engineering Squadron, Wright-Patterson AFB OH:

- SSgt Michael W. Bray, Prime BEEF Logistics NCOIC (4)
- Sgt Brian C. Cooke, Engineering Assistant (11)

Both SSgt Bray and Sgt Cooke have limited experience with computers. These individuals took on the role of program operators in order to investigate the BBMIS's user-interface features. Both sergeants were given an opportunity to become familiar with the program (approximately 20 minutes each) and were asked to access specific pieces of information from several different reports. SSgt Bray and Sgt Cooke were able to find the information quickly without any coaching. Sgt Cook commented on how quickly he felt at ease with the program (11). SSgt Bray pointed out one ambiguous menu option which was quickly corrected (4). He also expressed some concern that a typical tent lighting kit would not be adequate for viewing the laptop's liquid crystal display (LCD) monitor. SSgt Bray's point was well taken since LCDs use room light that reflects through the LCD to produce a display (55:3-11). Although it is beyond the scope of this

research, this point is noted for future research into computer hardware considerations for contingency deployments.

The second group consisted of the following faculty members of AFIT's School of Civil Engineering and Services:

- Maj Albert T. Stoddard III, Instructor, Airfield Pavement Engineering (ENG 550) (39)
- Capt Kenneth W. Polasic, Co-course Director for Air Base Combat Engineering (ENG 485) (32)
- Capt Jon A. Wheeler, Co-course Director for Air Base Combat Engineering (ENG 485) (51)

This group was asked to collaborate while evaluating the BBMIS program. After being given the basic operating instructions, they performed a comprehensive analysis of all aspects of the program. This two-hour evaluation yielded several minor errors and ambiguities, all of which were corrected. They also made the following suggestions which would improve the program, but were not included:

1. Add more detailed engineering data (i.e., pavement thickness, base material's California Bearing Ratio, age of the pavement, and the slope of the pavement) to the Airfield Information Module (39, 32, 51).

2. Add temper tent erection to the Manpower Requirements By Task Module. Temper tents are expected to replace general purpose tents for deployments to the Southwest Asian theater (39, 32, 51).

3. Integrate the BBMIS program with the Civil Engineering Support Plan Generator (CESPG) and the Time-Phased Force and Deployment List (TPFDL). Linking the BBMIS

program with these planning tools will help bridge the gap between planning a bare base deployment and actually deploying (39, 32, 51).

Overall, the field test was a success and took the BBMIS program one step closer to operationalizing a Bare Base Management Information System.

# V. Conclusions and Recommendations

## Chapter Overview

This chapter contains the conclusions reached in meeting the objectives of this research effort and offers recommendations for further research in the area of automated contingency management information systems.

## Conclusion 1

The hypothesis underlying this research is that a computerized management information system would supply timely and accurate support information to the CE commander during the initial stages of a bare base deployment. The results of the study support that hypothesis. The BBMIS program illustrates how one such MIS can support the initial information needs of a bare base CE commander.

Recommendation. Follow-on research is needed to validate the assumptions made in this study. This report assumed that the hardware used for the BBMIS would be environmentally sound for use under any field condition. Additional research into this area is needed to insure the hardware deployed is reliable.

A full scale operational test is also recommended for both the hardware and software. This is an essential step in identifying any potential problems arising from making this concept operational.

Conclusion 2

The purpose of the first investigative question was to identify the categories of unclassified information needed by a CE commander during the bare base beddown phase. Nineteen categories were identified and verified by three sources--regulations, exercise documents, and bare base experts. The number and range of information categories indicates that CE commanders are expected to collect and assimilate a large amount of information while in the field in order to effectively orchestrate a bare base beddown operation.

Recommendation. In order to fully realize the advantages of an automated bare base MIS, the scope of the BBMIS program must be expanded. For instance, the BBMIS program could easily be modified to accommodate the following information categories:

- Administrative Support Information
- Automated Language Dictionary
- Automated Bare Base Conceptual Planning Guild
- Bare Base Beddown Plan
- Base Denial Plan and Schedule
- "How To" Instructions
- Personnel Management Information
- Prioritized List of Mission Essential Facilities
- Procurement Support Information
- Work-Order Tracking

The data bases for each of these categories lend themselves to use with data base management, word processing, or spreadsheet applications. Enable, as demonstrated in this research, has advanced capabilities with all these applications.

Conclusion 3

Although this research illustrated how four information categories could be automated, many of the other categories are also suitable for automation on a microcomputer. Of the nineteen categories identified, several lend themselves to incorporation into the BBMIS program. Others are better suited as independent programs interfacing with, but not part of, the Bare Base Management Information System. Looking to the future, as more and more information becomes automated, the demand for fully integrated automated systems is certain to increase. Civil Engineering commanders are becoming more dependent upon the immediacy of information provided by WIMS during peacetime operations, and they will demand the same responsiveness while deployed to the field.

Recommendation. The remaining five information categories identified by the experts should also be incorporated into some type of management information system. However, this will require extensive research into marrying stand-alone integrated programs such as Enable with programs designed to handle unique requirements such as computer aided design, map displays, expert systems, and work scheduling programs. It is essential that research into linking different independent programs under a common data retrieval envelope be conducted. The future of this area of research lies in investigating the problems surrounding the complete integration of the BBMIS program with specialized software

and hardware to form a comprehensive management and engineering support system. This system should be capable of interfacing with WIMS and other agencies' main computers. It should be flexible enough that as technology and CE requirements grow, the system will evolve and adapt along with them.

Along the same lines, the IC-HAMS logistics management program shows promise for use in future versions of the BBMIS program, primarily because it is being designed with the field CE commander in mind. When completed, the IC-HAMS program should be considered for inclusion into a hybrid version of the BBMIS or linked to it through interfacing technology. The biggest advantage IC-HAMS has over the logistics information module developed in this study is that it will interface directly with Supply's main computer. This feature cuts down on redundant inputs and ensures an accurate up-to-the-minute inventory status.

Conclusion 4

To be truly effective the BBMIS program must be incorporated into home station training. Although this is an obvious conclusion, it is nevertheless an integral part of the overall success of the contingency MIS concept. As CE commanders become familiar with the BBMIS program, their confidence about using it in the field will increase. BBMIS is also a powerful training mechanism for exposing young officers to some of the complex management issues they

might face while deployed to the field. These issues may include the prioritization and allocation of scarce resources, the dissemination of vital geographical information to their troops, making informed decisions with regard to airfield operations, and planning for various contingency tasks so that they might be performed in an efficient manner. The more the BBMIS program is used in training, the more likely it will be relied on and used while in the field.

Recommendation. An analysis of home station training is needed to evaluate its effectiveness and to determine the best means of incorporating the BBMIS program. Formal command and control training is essential during peacetime for smooth operations during war and the BBMIS program is well suited to assist in this training.

## Other Recommendations

The following are some additional recommendations for this research.

1. Widen the scope of this research to include classified data. This will require researchers to identify and satisfy all TEMPEST requirements. This is an essential step in taking this concept off the training table and putting it into operation.

2. Apply the design methodology used in this study to develop a contingency MIS for use in different contingency

scenarios such as augmenting collocated operating base and main operating base forces.

3. Finally, a similar system should be developed to assist in managing the activities of Fire Departments while they are deployed to the field.

## Closing Remarks

As the twenty-first century approaches, it is becoming increasingly clear how automated information can improve managerial efficiency. The need for this higher level of efficiency within CE is best demonstrated during the beddown portion of a bare base deployment. Civil Engineering commanders faced with this tasking must assess their environments, allocate scarce resources, and make numerous critical decisions virtually simultaneously. There are limits to how fast even the most efficient commanders can process and act on information assembled by conventional methods. As this study has shown, automated support technology can be developed to help commanders make more--and theoretically better--decisions in the initial time-constrained hours of a bare base force beddown.

## Appendix A: Civil Engineering Contingency Regulations, Manuals, and Technical Orders

| | |
|---|---|
| AFR/AFM 28 Series | Mobility for Particular Command Mission |
| AFP 85-1 | Electrical Facilities Safe Practice Handbook |
| AFM 85-8 | Maintenance & Repair of Surface Areas |
| AFR 85-9 | Inactive Installation:Inactivation & Maintenance |
| AFR 85-10 | Operation & Maintenance of Real Property |
| AFM 85-12, Vol 1 & 2 | Operation & Maintenance of Heating Equipment and Systems & Process Heat Utilization |
| AFM 85-13 | Maintenance & Operations of Water Plants and Systems |
| AFM 85-14 | Maintenance & Operations of Sewage and Industrial Waste Plants and Systems |
| AFM 85-16 | Maintenance of Permanently Installed Storage & Dispensing Systems for Petroleum and Unconventional Fuels |
| AFM 85-17 | Maintenance & Operation of Electric Plants and Systems |
| AFM 85-18 | Maintenance & Operation of Refrigeration, A/C Evaporative Cooling and Mechanical Ventilating Systems |
| AFM 85-19 | Maintenance & Operation of Electric Power Generating Plants |
| AFM 85-20 | Plumbing |
| AFM 85-23 | Well Drilling Operations |
| AFM 85-31 | Industrial Water Treatment |
| AFM 85-33 | Maintenance & Repair of Expeditionary and Theater of Operations Airfield Facilities |
| AFM 85-44 | Heating, Cooling, Ventilating Handbook |
| AFM 86-3, Vol I | Planning & Design Theater of Operations Air Bases (1967) |
| AFM 86-8 | Airfield & Airspace Criteria |
| AFM 88-24 | Airfield Pavement Evaluation |
| AFM 88-34 | Field Engineering Handbook-Expedient Methods |
| AFR 91-4 | Maintenance & Operation of Electric Power Systems |
| AFR 91-5 | Utility Services |
| AFR 91-6 | Maintenance & Operation of Gas Systems |
| AFR 91-7 | Heating |
| AFR 91-10 | Operation & Maintenance of Air Force Waterworks Facilities |
| AFM 91-14 | Airfield and Base Snow and Ice Removal and Control |
| AFM 91-16 | Military Entomology Operational Handbook |
| AFM 91-17 | Electrical-Interior Facilities |
| AFR 93-2 | Disaster Preparedness & Base Recovery Planning |
| AFR 93-3 | The Prime BEEF Program |
| AFP 93-7 | Handbook for Prime BEEF Managers |

| | |
|---|---|
| AFR 93-9 | Civil Engineering RED HORSE Squadrons |
| AFM 127-100 | Explosive Safety Manual |
| AFM 127-101 | Industrial Safety Accident Prevention Handbook |
| AFP 161-3 | NATO Handbook on Medical Aspects of NBC Defensive Operations |
| AFM 161-10 | Field Hygiene and Sanitation |
| AFR 355-1 | Disaster Preparedness - Planning & Operations |
| AFP 355-1 | Fundamentals of Disaster Preparedness |
| AFR 355-5 | Armed Forces Doctrine for Chemical Warfare and Biological Defense |
| TM 5-280 | Foreign Mine Warfare Equipment |
| TM 5-297 | Well Drilling Operations |
| TM 5-330 | Planning & Design of Roads, Airbases, & Heliports in the Theater of Operations |
| TM 5-332 | Pits & Quarries |
| TM 5-700 | Field Water Supply |
| FM 3-10 | Employment of Chemical & Biological Agents |
| FM 3-50 | Chemical Smoke Generator Units & Smoke Operations |
| FM 5-1 | Engineer Troop Organization & Operations |
| FM 5-15 | Field Fortifications |
| FM 5-25 | Explosives & Demolition |
| FM 5-30 | Engineering Intelligence |
| FM 5-31 | Engineer Soldier Handbook |
| FM 5-33 | Construction Management |
| FM 5-34 | Engineer Field Data |
| FM 5-35 | Engineer Reference & Logistics Data |
| FM 5-166 | Well Drilling Operation |
| FM 5-248 | Foreign Maps |
| FM 9-16 | Explosive Ordnance Reconnaissance |
| FM 9-30 | Physical Security |
| FM 19-45-1 | Rear Area Protection |
| FM 20-15 | Pole & Frame Support Tents |
| FM 20-32 | Landmine Warfare |
| FM 20-60 | Battlefield Illumination |
| FM 21-26 | Map Reading |
| FM 21-30 | Military Symbols |
| FM 21-41 | Soldiers' Handbook for Defense Against Chemical & Biological Operations & Nuclear Warfare |
| FM 21-75 | Combat Training of the Individual Soldier and Patrolling |
| FM 23-12 | Technique of Fire of the Rifle Squad & Tactical Application |
| FM 23-67 | Machine Gun, 7.62mm, M-60 |
| FM 30-5 | Combat Intelligence |
| FM 30-10 | Terrain Intelligence |
| FM 101-10-1 | Army Organization |
| FM 101-40 | Armed Forces Doctrine for Toxic Chemical & Biological Weapons Employment & Defense |

| | |
|---|---|
| T.O. 35C2/Series | Generators |
| T.O. 35F5-3-9-11 | Medium Intensity Portable Field Lighting Sets |
| T.O. 35F8-21 | Type C3 Constant Current Runway Lighting Regulators |
| T.O. 40W4-9-1 | Water Purification |
| T.O. 11A-1-66 | General Instructions, Demolition |
| T.O. 35E8-2-5-1 | BAK-12 Aircraft Arresting Barrier |
| T.O. 37A12-15-1 | Fuel Bladders |
| T.O. 35E2-2-7 | AM2 Landing Mat |

## Appendix B: Telephone Interview With Bare Base Experts

Interviewee Data:

Name:_____. Date of Interview:_____.

Address:_____
_____.

Deployment Exercise:_____.

Any Comments off the record? YES NO

The following interview questions will be asked of selected C.E. commanders and MAJCOM planners of bare base exercises in order to summarize their informational requirements during their bare base deployment experience:

1. Approximately how many hours or days did you have between the time you knew you were going to deploy and the actual deployment?

2. What were your key activities during that time? What did you need to assemble, prepare, etc?

3. How many C.E. troops were deployed and how many troops were they bedding down? How long did it take?

4. Describe any problems you encountered during the beddown portion of you deployment?

5. Were you able to choose your own staff or deployment members? If you were able to choose staff or team members, what characteristics did you consider important in that selection?

6. What information was provided to you prior to deployment (e.g., site maps, personnel roster, topography, mission, deployment length, site layout)? What form was this information in (i.e. printed, computer rip, oral)?

7. Where there any categories of information you wanted before you deployed that you were not able to obtain? Any idea why it could not be obtained? Would that information be available now?

8. What other categories of information did you need once you arrived on site (e.g., water source, pavement condition, scheduling information, resource listing)?

9. The following is a list of information categories already identified from regulations and exercise documents. Please comment on each category's utility. Given these categories, would you like to add any additional categories.

10. If you had the ability to take a computer on a bare base deployment, what information or software would you have included to help with beddown operations?

11. Can you recommend any other experienced individuals I ought to talk to?

A "*" indicates off-the-record comments.

## Appendix C: Survey of Bare Base Experts

Lt Col Thomas M. Hanson
HQ SAC/DER
Offutt AFB, NE. 68113

1 March 1988

Dear Lt Col Hanson,

Thank you very much for the general information you provided concerning your bare base deployment experience. That information, combined with the inputs from governing regulations and other exercise documentation, is included in the list attached to this letter.

As I explained when we talked on the phone, my research goal is to create a computer program that will supply needed information to commanders in the field during deployments. For this initial program, I need to select from the list a subset that contains the most needed or important categories of information. I would appreciate your help in identifying these categories through the following two-step procedure:

- First, review the attached list and add any additional unclassified information categories you feel would be helpful to a deployed C.E. bare base commander.

- Then, select the seven (7) boldfaced categories you consider to be most important. Use the numbers 1 - 7 to indicate their relative importance (1 = most important).

I have enclosed a self-addressed, post-paid envelope for your convenience. Again, thank you for your assistance and please feel free to call me at AV 785-4354 if you have any questions.

Mark A. Pohlmeier, Capt, USAF
Student, Graduate Engineering Management
School of Systems and Logistics, AFIT

Attch 1.
1. Bare Base Unclassified Information Categories.

## Bare-Base Unclassified Information Categories

CATEGORIES

____ 1. **Automated work Schedule (e.g., CPM, PERT)**

____ 2. **Automated bare-base layout**

____ 3. **Logistics management:**
- a. Track consumption rates
- b. Automated hand receipts
- c. Track location and quantity of items
- d. Track supply and demand of items
- e. Listing of War Reserve Materials on site
- f. Listing of vehicles and status

____ 4. **Topographical information (site specific)**

____ 5. **Geographical information:**
- a. Local religious customs
- b. Local cultural customs
- c. Local business customs
- d. Local health information
- e. Local engineering considerations
- f. Local climate
- g. Map of bare-base sites
- h. Detailed descriptions of bare-base sites
- i. Location and quality of water sources

____ 6. **Personnel management:**
- a. Personal background information
- b. Their chain of command
- c. Training/experience levels
- d. Billeting data

____ 7. **Work order tracking**

____ 8. **"How To" instructions:**
- a. Expedient methods
- b. Equipment set-up and operation
- c. Harvest Bare/Eagle/Falcon set-up
- d. Anti-terrorist techniques

____ 9. **Engineering design support information**

CATEGORIES

____10. **Procurement (LGC) support:**
- a. Specifications for unique items
- b. Manufactures data
- c. Drawings of specialty items

____11. **Automated language dictionary**
e.g. INPUT hello --> OUTPUT hola (Spanish)

____12. **Base denial plan and schedule**

____13. **Man-power requirements by task:**
- a. Number of man-hours by task
- b. Typical crew size by task
- c. Minimum experience level by task

____14. **Airfield data**
ie. size, type, barriers, nav aids, lights

____15. **Administrative Support:**
- a. Report and message templates
- b. General word processing support
- c. General spreadsheet support w/ graphics
- d. General data base management support

____16. **Expert System:**
- a. Pavement evaluation
- b. Trouble-shoot major equipment

____17. **Prioritized list of mission essential facilities**

____18. **Automated Bare-Base Conceptual Planning Guild**

Additional Information Categories:

____19. _____

____20. _____

____21. _____

Comments:

Appendix D: Summary of the Bare Base Expert's Ranking of Information Categories

| INFORMATION CATEGORIES | HANSON | PETRYSZYN | FOX | MILLS | WILSON | CARSON | FREQUENCY COUNT | SUM OF RANKINGS | OVERALL RANKING |
|---|---|---|---|---|---|---|---|---|---|
| Automated Work Schedule | 4 | 8 | 8 | 8 | 8 | 4 | 2 | 40 | 6 |
| Automated Bare Base Layout | 8 | 8 | 7 | 8 | 8 | 3 | 2 | 42 | 8 |
| Logistics Information | 1 | 1 | 5 | 4 | 3 | 6 | 6 | 20 | 2 |
| Topographical Information | 8 | 5 | 3 | 3 | 8 | 8 | 3 | 35 | 5 |
| Geographical Information | 3 | 2 | 4 | 2 | 8 | 8 | 4 | 27 | 3 |
| Personnel Management | 6 | 6 | 8 | 8 | 8 | 5 | 3 | 41 | 7 |
| Work Order Tracking | 8 | 8 | 8 | 8 | 8 | 8 | 0 | 48 | 11 |
| 'How To' Instructions | 8 | 8 | 8 | 7 | 4 | 8 | 2 | 42 | 8 |
| Engineering Design Support | 8 | 8 | 8 | 8 | 8 | 8 | 4 | 48 | 11 |
| Procurement (LGX) Support | 8 | 8 | 8 | 5 | 5 | 7 | 3 | 41 | 7 |
| Automated Language Dictionary | 8 | 8 | 8 | 8 | 8 | 8 | 0 | 48 | 11 |
| Base Denial Plan and Schedule | 8 | 8 | 8 | 8 | 8 | 8 | 0 | 48 | 11 |
| Manpower Requirements by Task | 8 | 7 | 2 | 8 | 7 | 2 | 4 | 34 | 4 |
| Airfield Information | 2 | 3 | 1 | 1 | 2 | 8 | 5 | 17 | 1 |
| Administrative Support | 5 | 8 | 8 | 8 | 8 | 8 | 1 | 45 | 10 |
| Expert System | 8 | 8 | 6 | 6 | 8 | 8 | 2 | 44 | 9 |
| Prioritized List of Mission Essential Facilities | 8 | 4 | 8 | 8 | 6 | 8 | 2 | 42 | 8 |
| Automated Bare Base Conceptual Planning Guild | 7 | 8 | 8 | 8 | 8 | 1 | 2 | 40 | 6 |
| Bare Base Beddown Plan | 8 | 8 | 8 | 8 | 1 | 8 | 1 | 41 | 7 |

## Appendix E: Interview Questions For Software Consultants

The purpose of this semi-structured interview is to help identify commercial software which could be used to automate the following bare base information categories:

**Information Categories**

a. Logistics Information
b. Geographical Information
c. Airfield Information
d. Manpower Data by Task

Additionally, this interview will be used to determine how to integrate these programs into a management information system for use by the bare base C.E. commander.

Interview Questions:

1. Given the operating features, what general type of personal computer (PC) software would you recommend for each information category (ie, spreadsheet, database manager, specialty programs, or language)? Why?

2. What specific PC software would you recommend be use to automate each information category (give brand names)?

3. What are the most helpful features of the PC software identified in question #1 and what are the most limiting?

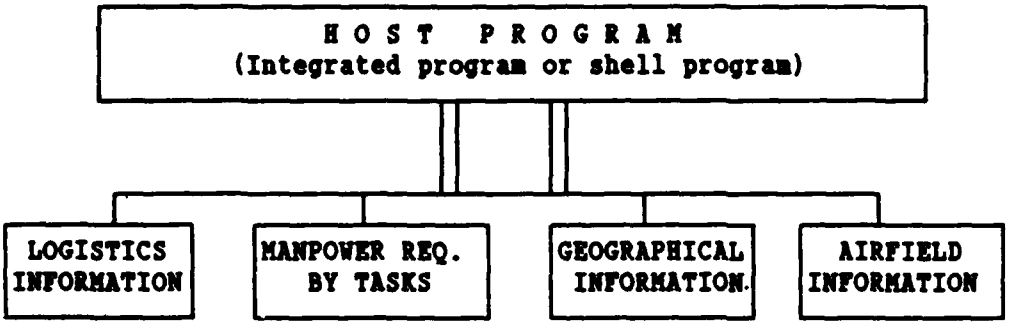
4. Are there any integrated PC software programs that fulfill the operating features for more than one of the software types previously identified?

5. What features of the software identified in question #3 do you appreciate and what are its limitations?

6. Are you familiar with any commercial shell menu programs (i.e., Pathmaster) that could tie all the components of this MIS together into an integrated program? If so, what are they and what makes them noteworthy?

7. Similarly, are you aware of any personal computer languages that could adequately tie all the components of this MIS together into an integrated program? If so, what are they and what makes them suitable for this purpose?

Bare Base Management Information System



Appendix F: Airfield Information Module Reports

PAGE 1 AIRFIELD ENGINEERING REPORT 10 August 1988

ALL THE INFORMATION CONTAINED WITHIN THIS REPORT IS UNCLASSIFIED!

THIS REPORT CONTAINS THE PERTINENT AIRFIELD DATA NEEDED IN PLANNING AND AND CONDUCTING ENGINEERING TASKS FOR THE ASWAN AIRBASE IN EGYPT

| RUNWAY NUMBER | RUNWAY LENGTH | RUNWAY WIDTH | RUNWAY SHOULDER | RUNWAY HEADING | BASE MATERIAL | PAVEMENT SURFACE |
|---|---|---|---|---|---|---|
| 1 | 11,100 | 125 | ASPHALT | 17-35 | SP | ASPHALT |

EXISTING AIRFIELD COMPONENTS:

VOR, NON-DIRECTIONAL BEACON (NDB), NO TOWER

MA-1A BARRIER IN PLACE ON RUNWAY NO.1

COMMENTS:

PRIMARY AIRFIELD FOR STAGING TACTICAL AIRCRAFT TO INCLUDE F-15, A-10, A-7, F-4, AND C-130. PAVEMENT REPORTS INDICATE THAT THE PVMT CAN WITHSTAND APPX. 2400 PASSES WITH A F-15. OVERRUNS ARE LOOSE SAND AND WILL REQUIRE SOME STABILIZATION.

PAGE 1 AIRFIELD SUPPLEMENTAL REPORT 10 August 1988

ALL THE INFORMATION CONTAINED WITHIN THIS REPORT IS UNCLASSIFIED!

THE PURPOSE OF THIS REPORT IS TO PROVIDE THE C.E. COMMANDER WITH THE ESSENTIAL SUPPLEMENTAL INFORMATION ABOUT BIR ABU RAHAL AIRBASE IN EGYPT

1. AIRFIELD'S COORDINATES: 25 00'N 33 31'E 2. ELEVATION: N/A

3. PRINCIPAL USER(S): NO DATA

4. NEARBY CITY, POPULATION, AND LOCATION:

NONE

5. LOCAL VEGITATION:

BRIEF LIFE CYLCE VEGETATION; SHRUBS; DESERT

6. *LOCAL RELIEF:*

TABLELANDS AND PLATEAUS; GENTLE SLOPES; LOCAL RELIEF OVER 300 FT

7. COMMENTS:

70 MILES NORTH-NORTHEAST OF ASWAN.

CLASSIFIED SITE.

PAGE 1 PRIMARY AIRFIELD LOGISTICS REPORT 10 August 1988

| SIN NO. | RESOURCE DESCRIPTION | U/M | QUANTITY ON-HAND | QUANTITY ON-SITE | AIRFIELD SUPPORT |
|---|---|---|---|---|---|
| 1 | WATER BUFFALO (600 GAL) | EA | 1 | 1 | Yes |
| 3 | FIRE TRUCK, P-19 | EA | 1 | 1 | Yes |
| 4 | CRASH TRUCK, P-15 | EA | 1 | 1 | Yes |
| 7 | DUMP TRUCK | EA | 1 | 1 | Yes |
| 9 | GRADER SIZE 2 | EA | 1 | 1 | Yes |
| 10 | FRONT END LOADER 2 1/2 CY | EA | 1 | 1 | Yes |
| 11 | VACUUM SWEEPER | EA | 1 | 1 | Yes |
| 12 | TOW SWEEPER | EA | 1 | 1 | Yes |
| 15 | EXCAVATOR | EA | 1 | 1 | Yes |
| 21 | BULLDOZER | EA | 1 | 1 | Yes |
| 25 | ALLOY BRAZING SILVER 1/16" | EA | 1 | 1 | Yes |
| 31 | ANTIFREEZE MIX 30GAL DR | EA | 3 | 3 | Yes |
| 51 | BLOCK ICE MACHINE | EA | 1 | 1 | Yes |
| 66 | CABLE ELECTRIC RUBBER | CL | 1 | 1 | Yes |
| 124 | ENTO-INSECTICIDE DIAZINON 48%EC 1GAL | GAL | 0 | 2 | Yes |
| 228 | LIGHTING SYS BARE BASE REMOTE 'RALS' | EA | 0 | 1 | Yes |
| 283 | PAINT TRAFFIC MARKING WHITE | EA | 3 | 6 | Yes |

Appendix G:

Geographical Information Module Reports

GEOGRAPHICAL INFORMATION MODULE

I. REGIONAL INFORMATION FOR SOUTHWEST ASIA (SWA)

HEALTH FACTORS AFFECTING THE ENGINEERING WORKFORCE -- DISEASES AND ILLNESSES

Eye Disease. In some areas of the region, eye diseases produce blindness in 20 percent of the population. Prime BEEF personnel should consult medical personnel for protective measures if this is a problem near the deployment site.

Hepatitis. Hepatitis is the destruction of liver cells caused by a virus entering the body through the digestive system or the circulatory system (e.g., blood transfusions or contaminated injection needles). The most common form of hepatitis in the Middle East is viral hepatitis, caused by eating food or water contaminated by feces of infected person. Mild hepatitis symptoms, include fever, muscle aches, headache, and appetite loss. More severe cases involve jaundice, nausea, fatigue, and a swollen, tender liver.

DO --treat with bed rest and a high protein diet.
--eat only carefully washed and well-prepared food.
--emphasize personal hygiene.
--drink only water known to be pure.

An injection of human immuno-globulin gives partial protection lasting four to six months.

Intestinal Upsets. Intestinal upsets are usually caused by a diet change or water borne microorganisms. To reduce the severity of resulting diarrhea:

DO --boil drinking water.

DO NOT --buy food from natives.
--eat uncooked food.

Severe diarrhea with severe stomach pains could be dysentery. Seek medical advice for these symptoms.

Malaria. Although malaria is generally eradicated from the region, it is still a problem in the southern Arabian peninsula, where a resistant strain of mosquitoes has developed. Only the anopheline mosquito carries malaria. This mosquito normally bites after dark. Symptoms of malaria include fever, spleen enlargement, and anemia caused by destruction of red blood cells.

## GEOGRAPHICAL INFORMATION MODULE

### I. HOST COUNTRY (EGYPT) INFORMATION

**DEMOGRAPHIC AND GEOGRAPHIC BACKGROUND -- EGYPT'S CLIMATE**

Egypt is climatically part of the northern African desert. Summers are generally hot and rainless, with the extreme northern coast temperature modified somewhat by the Mediterranean Sea. The highest average temperatures occur in July or August in the north, but usually occur in June in the southern part of the country. The months of October and November are warm, accompanied by higher humidity and more precipitation. The spring months of March, April, and May are hot and dry. Hot, driving windstorms may occur during this time, caused by an east wind from the Sahara. These winds can raise the temperature 19° C (35° F) in two hours. The storms sometimes last for days, causing great discomfort to people and animals,, and possible crop damage.

Precipitation may vary widely from year to year. One day of rain can affect rainfall averages for years. Every part of Egypt can be completely dry in any one month. Most of the rain that does fall is north of 28 degrees latitude. The area south of this latitude is virtually rainless.

Thunderstorms are restricted mainly to the northern part of the country, with some areas averaging seven thunderstorms per year. Again, almost no thunderstorms occur south of 28 degrees latitude.

Wind is generally highest along the coastal areas, and decreases inland. Wind speed averages 9 to 12 miles per hour along the coast and 4 to 8 miles per hour inland.

Day-to-night temperature variation averages 10° C (18° F) near the coastal areas, and about 15° C (27° F) inland. For inland areas, this temperature variation is significant. Nights are usually much more comfortable than daytime.

Mean annual sunshine hours are about 3,200 for northern coastal areas, increasing to over 4,000 hours in the southern quarter of the country. Based on an average of 12 daylight hours per day, there are about 4,400 daylight hours in a year. Thus, the southern part of Egypt has sunshine over 90 percent of the daylight hours.

For the northern coast, the mean temperatures in January are 18° C maximum, 8° C minimum (65° F, 70° F). Humidity in this region is fairly steady at about 70 percent year around.

Along the Red Sea, the mean temperatures in January are 22° C (71° F) for a high, 10° - 13° C (50-55° F) for a low. For July, the average high is 34° C (94° F), and the average low 24-27° C (75-80° F). Humidity normally falls in the 50-60 percent range.

DO --wear long sleeves and trousers.
--use insect repellent on exposed skin.
--use insect sprays and mosquito netting.
--take anti-malarial tablets, and continue dosage for 28 days after leaving area, because malaria incubates 10-14 days in the bloodstream.

Table 1 shows anti-malarial drugs, times between doses, and common manufactured names:

TABLE 1

Anti-Marlarial Drugs, Time Between Doses, and Common Manufactured Names

| Drug | Time Between Doses | Common Manufactured Name |
|---|---|---|
| Proguanil | Daily | Paludrine, Chlorguanide |
| Pyrimethamine | Weekly | Daraprim |
| Chloroquine | Weekly | Aralen, Aulocor Nivaquine, Resochin |
| Amodiaquine* | Weekly | Camoquin, Flavoquine |

*Avoid amodiaquine during pregnancy.

Parasitic Infections. Irrigation has increased the incidence of parasitic infections. These infections result in mild to severe dysentery, with newcomers especially susceptible.

Typhoid and Cholera. Typhoid is prevalent in some areas, as are periodic outbreaks of cholera. These diseases should pose no threat to properly immunized Prime BEEF team members.

## GEOGRAPHICAL INFORMATION MODULE

### I. HOST COUNTRY (EGYPT) INFORMATION

**DEMOGRAPHIC AND GEOGRAPHIC BACKGROUND -- BRIEFING NOTES FOR EGYPT**

Cameras. Cameras are prohibited in the vicinity of the aerodrome. No pictures of bridges or government buildings are allowed. Only tourist photography is allowed.

Clothing. Summer clothing is recommended May-October. Light winter clothing is more suitable November-April.

Electric Supply. 220V AC 50Hz; plugs are 2-pin round.

Fixed Holidays (Julian calendar):

| | |
|---|---|
| 1 Jan | New Year's Day |
| 8 Mar | Syrian Revolution Day |
| 18 Jun | Evacuation Day |
| 23 Jul | Anniversary of the Revolution |
| 1 Sep | Libyan Revolution Day |
| 24 Oct | Popular Resistance Day |
| 23 Dec | Victory Day |

Local Time. Greenwich Mean Time plus 2 hours (3 hours if U.S. is on daylight time). When it is 1200 hours in New York, it is 1900 hours in Cairo, 2000 hours during daylight savings time.

Military Rank and Insignia:

| | |
|---|---|
| Colonel | Eagle and 2 stars |
| Lt Colonel | Eagle and 1 star |
| Major | Eagle |
| Captain | 3 stars |
| 1 Lt | 2 stars |
| 2 Lt | 1 star |

Prohibited Items. Narcotics and raw cotton.

Weights and Measures. Metric system.

**DEMOGRAPHIC AND GEOGRAPHIC BACKGROUND -- EGYPT'S RELIGION AND CULTURE**

Egypt is one of the more liberal Arab countries. Alcohol is legal, and sexes are not strictly segregated. However, Egyptian society generally values men more than women. Although many Egyptian women are trained professional people, many others are still confined to the home. The younger generation of Egyptians is more liberal about women's roles.

In the interior, the normal maximum temperatures in January are 21-24 C (70-75° F); 4-10° C (40-50° F) for the average minimum. In July, anytime temperatures average between 38-43° C (100-110° F), lowering to 21-27° C (70-80° F) at night. Humidity is generally less than 50 percent.

In Cairo, the mean maximum temperature in January is 18° C (65° F); 9° C (48° F) for the mean minimum. In July, the average temperatures are 36° C (96° F) during the day, and 22° C (71° F) at night. Humidity normally is between 50 and 65 percent.

APPENDIX H:

Manpower Requirements By Task Module Report

MANPOWER REQUIREMENTS BY TASK

FACILITY TITLE: TASK NO.: 26

26. PREFAB METAL BUILDING - 40x100 (FULL ENVIRONMENTAL CONTROL)

GENERAL DESCRIPTION OF THE TASK:

PREFAB STELL FRAME BUILDING, 40x100x9 FEET, WITH METAL ROOF/CLADDING, CONCRETE FLOOR, INSULATION, LIGHTING, HEATING, AND AIR CONDITIONING.

| TASK(S) | CREW SIZE(S) * HORZ | VERT | GEN | MAN-HOURS HORZ | VERT | GEN | TOT |
|---|---|---|---|---|---|---|---|
| 1.PREPARE SITE | 1 | 0 | 2 | 12 | 0 | 10 | 22 |
| 2.INSTALL CONCRETE FORMS AND SLAB | 1 | 10 | 2 | 8 | 368 | 4 | 380 |
| 3.ERECT BUILDING AND INSULATION | 2 | 22 | 15 | 78 | 1384 | 812 | 2274 |
| 4.INSTALL LIGHTS AND OUTLETS | 0 | 4 | 0 | 0 | 72 | 0 | 72 |
| 5.INSTALL ELECTRICAL SERVICE ENTRANCE | 0 | 2 | 0 | 0 | 16 | 0 | 16 |
| 6.INSTALL HEATING UNITS (2 EACH) | 0 | 2 | 0 | 0 | 8 | 0 | 8 |
| 7.INSTALL AIR CONDITIONING UNITS (4EA) | 0 | 1 | 1 | 0 | 4 | 4 | 0 |
| TOTALS: | 4 | 41 | 20 | 98 | 1852 | 830 | 2780 |

* ADDITIONAL CREW SIZE COMMENTS:

GENERAL COMMENTS:

BUILDING CAN BE EXTENDED OR SHORTENED IN 20-FOOT INCREMENTS AND CAN BE ERECTED WITHOUT HEAVY EQUIPMENT, BUT MAN-HOURS WOULD BE GREATER.

PROVIDES FOR 9 FOOT SUSPENDED CEILING. PLUMBING IS NOT INCLUDED.

HEATING UNITS ARE FUEL OIL FIRED AND 120,000 BTU EACH AND AIR

CONDITIONERS ARE 54,000 BTU EACH. SUITABLE FOR USE AS AN ADMINISTRATIVE

AREA, ELECTRONICS SHOP, PMEL LAB, COMMUNICATIONS FACILITY, OR OTHER

BUILDING WHICH REQUIRES ENVIRONMENTAL CONTROL. ASSUMES ONLY MINIMAL

SITE PREPARATION IS REQUIRED.

SOURCE OF MANPOWER REQUIREMENTS DATA:

AF PUB 86-10: PAGE 1-0016 (FACILITY); PAGE 5-0015 (AIR CONDITIONER);

PAGE 5-0017 (HEATING UNIT).

NAVY P437, VOL 1, BOOK 2: DRAWING NO. 600255 (INSULATION); DRAWING

NO. 1109858 (LIGHTING).

NAVY P437, VOL 2, PART III: PAGE 47, ASSEMBLY NO. 12050 (SITE PREP AND

CONCRETE); PAGE 30, ASSEMBLY NO. 11703 (WALLS) AND ASSEMBLY NO. 11704

(CEILING); PAGE 369, ASSEMBLY NO. 30101 (LIGHTING); PAGE 392, ASSEMBLY

NO. 31000 (ELECTRICAL SERVICE ENTRANCE).

ARMY TM-301-1, FACILITY NO. 44113 (ERECTION MAN-HOURS).

Appendix I: Logistics Information Module Reports

PAGE 1 COMMANDER'S LOGISTICS REPORT 10 August 1988

| SIN NO. | RESOURCE DESCRIPTION | U/M | QUANTITY ON-HAND | QUANTITY ON-SITE | CRITICAL INVENTORY |
|---|---|---|---|---|---|
| 1 | WATER BUFFALO (600 GAL) | EA | 1 | 1 | No |
| 2 | PANEL VAN | EA | 1 | 1 | No |
| 3 | FIRE TRUCK, P-19 | EA | 1 | 1 | Yes |
| 4 | CRASH TRUCK, P-15 | EA | 1 | 1 | Yes |
| 5 | PICKUP (3 PAK) | EA | 1 | 1 | No |
| 6 | PICKUP (3 PAK) | EA | 1 | 1 | No |
| 7 | DUMP TRUCK | EA | 1 | 1 | No |
| 8 | TRENCHER WITH BACKHOE | EA | 1 | 1 | No |
| 9 | GRADER SIZE 2 | EA | 1 | 1 | No |
| 10 | FRONT END LOADER 2 1/2 CY | EA | 1 | 1 | No |
| 11 | VACUUM SWEEPER | EA | 1 | 1 | Yes |
| 12 | TOW SWEEPER | EA | 1 | 1 | Yes |
| 13 | TRUCK, WATER A-2 (2600 GAL) | EA | 1 | 1 | No |
| 14 | FORKLIFT, ALL-TERRAIN (13K) | EA | 1 | 1 | No |
| 15 | EXCAVATOR | EA | 1 | 1 | No |
| 16 | FARM TRACTOR IW70 | EA | 1 | 1 | No |
| 17 | ONE HALF TON PICK-UP | EA | 1 | 1 | Yes |
| 18 | WATER PUMPER TRUCK | EA | 1 | 1 | No |
| 19 | FARM TRACTOR | EA | 1 | 1 | No |
| 20 | PANEL VAN | EA | 1 | 1 | No |
| 21 | BULLDOZER | EA | 1 | 1 | Yes |
| 22 | ADAPTER 1 1/2 MALE | EA | 20 | 20 | No |
| 23 | ADAPTER 1 1/2 PVC FPT | EA | 22 | 22 | No |
| 24 | ALARM BURGLAR | EA | 1 | 1 | No |
| 25 | ALLOY BRAZING SILVER 1/16" | EA | 1 | 1 | No |
| 26 | ANCHOR | EA | 10 | 10 | No |
| 27 | ANCHOR KIT | EA | 2 | 2 | No |
| 28 | ANCHOR WEDGE TURNBELT | HD | 1 | 1 | No |
| 29 | ANCHOR, MULTI-SET | HD | 5 | 5 | No |
| 30 | ANSULITE 55GAL DR | EA | 4 | 4 | No |
| 31 | ANTIFREEZE MIX 30GAL DR | EA | 3 | 3 | No |
| 32 | APRON NAIL | EA | 39 | 40 | No |
| 33 | ASSEMBLY PARTS MISC | EA | 50 | 58 | No |
| 34 | AXE | EA | 6 | 6 | No |
| 35 | AXE BUSH | EA | 4 | 4 | No |
| 36 | BAG PLASTIC | BX | 9 | 9 | No |
| 39 | BANDING 5/8" | CL | 3 | 3 | No |
| 40 | BANDING CLIPS | EA | 2000 | 2000 | No |
| 41 | BANDING ROLL 1" | EA | 8 | 8 | No |
| 42 | BAR CROW | EA | 25 | 30 | No |
| 43 | BATTERIES AA | EA | 9 | 12 | No |
| 44 | BATTERIES D CELL | BX | 1 | 1 | No |

| SIN NO. | NOUN | U/M | STOCK NUMBER | INVENTORY STATUS | AIRFIELD SUPPORT | TASK NO. |
|---|---|---|---|---|---|---|
| 47 | BIKE | EA | N/A | BCE | No | |
| 48 | MISC | EA | A064H | BCE | No | |
| 49 | MISC | BX | I053R | BCE | No | |
| 50 | TOOL | EA | N/A | BCE | No | |
| 51 | ICE MACHINE | EA | N/A | TURNER/SVS | Yes | |
| 53 | BOX | EA | B193 | BCE | No | |
| 54 | BOX | EA | N/A | BCE | No | |
| 55 | BOX | EA | B083A | BCE | No | |
| 57 | BREAKER | EA | B098J | BCE | No | |
| 58 | BREAKER | EA | C139H | BCE | No | |
| 59 | MISC | EA | N/A | BCE | No | |
| 60 | BROOM | EA | 7920-00-292-236 | BCE | No | |
| 61 | BROOM | EA | N/A | BCE | No | |
| 63 | BUSHING | EA | A053B | BCE | No | |
| 65 | CABLE | FT | N/A | BCE | No | |
| 66 | CABLE | CL | N/A | BCE | Yes | |
| 67 | CHEM | EA | N/A | BCE | No | |
| 68 | CAMO | EA | N/A | WILSON/SP | No | 12 |
| 69 | CAMO | EA | N/A | BCE | No | 13 |
| 70 | CAN | EA | N/A | BCE | No | |
| 71 | CAN | EA | N/A | BCE | No | |
| 72 | MISC | EA | 8465-01-115-002 | BCE | No | |
| 73 | MISC | EA | A057K | BCE | No | |
| 74 | CHAIN | FT | R1492930-399 | BCE | No | |
| 75 | CHAIN | FT | I087F | BCE | No | |
| 76 | MISC | EA | 6508001161473 | BCE | No | |
| 77 | PUMP | EA | N/A | BCE | No | 30 |
| 78 | CHEM | EA | PNMIL-C-11029 | BCE | No | 30 |
| 79 | CLAMP | EA | 5999000290682 | BCE | No | |
| 80 | CLAMP | EA | A066A | BCE | No | |
| 81 | CLIPBOARD | EA | N/A | BCE | No | |
| 82 | CONNECTOR | EA | N/A | BCE | No | |
| 83 | CONNECTOR | EA | B163 | BCE | No | |
| 84 | CONNECTOR | EA | N/A | BCE | No | |
| 85 | CONNECTOR | EA | N/A | BCE | No | |
| 86 | CONNECTOR | EA | N/A | BCE | No | |
| 87 | CONNECTOR | EA | N/A | BCE | No | |
| 88 | CONNECTOR | EA | B549 | BCE | No | |
| 89 | CONNECTOR | EA | B330 | BCE | No | |
| 90 | COOLER | EA | N/A | BCE | No | |
| 91 | GROUND ROD | FT | N/A | BCE | No | |
| 92 | CORD | BX | N/A | BCE | No | |
| 93 | CORD | RO | 4020007102074 | BCE | No | |
| 94 | COT | EA | N/A | BCE | No | |

NOTE: THIS REPORT IS DESIGNED TO BE USED IN CONJUNCTION WITH THE COMMANDER'S LOGISTICS REPORT.

| SIN NO. U/M | U/C | PLT-BOX | INV SOURCE | BIN | QUANTITY ON-HAND | ON-SITE | COMMENTS |
|---|---|---|---|---|---|---|---|
| EA | $0.00 | | WRM | | 1 | 1 | ANY REMARKS! |
| 22 | | | | | | | |
| EA | $0.00 | P70-1 | HA | | 20 | 20 | ANY REMARKS! |
| 23 | | | | | | | |
| EA | $0.00 | P70-1 | HA | | 22 | 22 | ANY REMARKS! |
| 24 | | | | | | | |
| EA | $0.00 | P70-2 | HA | | 1 | 1 | ANY REMARKS! |
| 25 | | | | | | | |
| EA | $0.00 | P70-3 | HA | | 1 | 1 | ANY REMARKS! |
| 26 | | | | | | | |
| EA | $0.00 | P70-8 | HA | | 10 | 10 | ANY REMARKS! |
| 27 | | | | | | | |
| EA | $0.00 | P70-2 | HA | | 2 | 2 | ANY REMARKS! |
| 28 | | | | | | | |
| ED | $0.00 | P70-8 | HA | | 1 | 1 | ANY REMARKS! |
| 29 | | | | | | | |
| ED | $0.00 | P71-13 | HA | | 5 | 5 | ANY REMARKS! |
| 30 | | | | | | | |
| EA | $0.00 | P70-1 | HA | | 4 | 4 | ANY REMARKS! |
| 31 | | | | | | | |
| EA | $0.00 | P70-4 | HA | | 3 | 3 | ANY REMARKS! |
| 32 | | | | | | | |
| EA | $0.00 | P70-9 | HA | | 39 | 40 | ANY REMARKS! |
| 33 | | | | | | | |
| EA | $0.00 | P70-R6 | HA | | 50 | 58 | ANY REMARKS! |
| 34 | | | | | | | |
| EA | $0.00 | P70-15 | HA | | 6 | 6 | ANY REMARKS! |
| 35 | | | | | | | |
| EA | $0.00 | 2106739 | HA | | 4 | 4 | ANY REMARKS! |
| 36 | | | | | | | |
| EX | $0.00 | P70-12 | HA | | 9 | 9 | ANY REMARKS! |
| 39 | | | | | | | |
| CL | $0.00 | P72-2 | HA | | 3 | 3 | ANY REMARKS! |
| 40 | | | | | | | |
| EA | $0.00 | P72-2 | HA | | 2000 | 2000 | ANY REMARKS! |
| 41 | | | | | | | |
| EA | $0.00 | P72-2 | HA | | 8 | 8 | ANY REMARKS! |
| 42 | | | | | | | |
| EA | $0.00 | P72-2 | HA | | 25 | 30 | ANY REMARKS! |
| 43 | | | | | | | |
| EA | $0.00 | P72-2 | PB | | 9 | 12 | ANY REMARKS! |

PAGE 1 VEHICLE STATUS REPORT 10 August 1988

| SIN NO. | RESOURCE DESCRIPTION | REGISTRATION NUMBER | VEHICLES ON-HAND | VEHICLE STATUS |
|---|---|---|---|---|
| 1 | WATER BUFFALO (600 GAL) | R-7206-010 | 1 | GOOD |
| 2 | PANEL VAN | R-7206-011 | 1 | GOOD |
| 3 | FIRE TRUCK, P-19 | R-7206-012 | 1 | MAINT |
| 4 | CRASH TRUCK, P-15 | R-7206-013 | 1 | GOOD |
| 5 | PICKUP (3 PAK) | R-7206-014 | 1 | POOR |
| 6 | PICKUP (3 PAK) | R-7206-015 | 1 | GOOD |
| 7 | DUMP TRUCK | R-7206-016 | 1 | GOOD |
| 8 | TRENCHER WITH BACKHOE | R-7206-017 | 1 | POOR |
| 9 | GRADER SIZE 2 | R-7206-018 | 1 | GOOD |
| 10 | FRONT END LOADER 2 1/2 CY | R-7206-019 | 1 | GOOD |
| 11 | VACUUM SWEEPER | R-7206-020 | 1 | GOOD |
| 12 | TOW SWEEPER | R-7206-021 | 1 | GOOD |
| 13 | TRUCK, WATER A-2 (2600 GAL) | R-7206-022 | 1 | POOR |
| 14 | FORKLIFT, ALL-TERRAIN (13K) | R-7206-023 | 1 | GOOD |
| 15 | EXCAVATOR | R-7206-024 | 1 | GOOD |
| 16 | FARM TRACTOR IW70 | R-7206-025 | 1 | GOOD |
| 17 | ONE HALF TON PICK-UP | R-7206-026 | 1 | GOOD |
| 18 | WATER PUMPER TRUCK | R-7206-027 | 1 | GOOD |
| 19 | FARM TRACTOR | R-7206-028 | 1 | GOOD |
| 20 | PANEL VAN | R-7206-029 | 1 | GOOD |
| 21 | BULLDOZER | R-7206-030 | 1 | GOOD |

PAGE 1 PRIMARY AIRFIELD LOGISTICS REPORT 10 August 1988

| SIN NO. | RESOURCE DESCRIPTION | U/M | QUANTITY ON-HAND | QUANTITY ON-SITE | AIRFIELD SUPPORT |
|---|---|---|---|---|---|
| 1 | WATER BUFFALO (600 GAL) | EA | 1 | 1 | Yes |
| 3 | FIRE TRUCK, P-19 | EA | 1 | 1 | Yes |
| 4 | CRASH TRUCK, P-15 | EA | 1 | 1 | Yes |
| 7 | DUMP TRUCK | EA | 1 | 1 | Yes |
| 9 | GRADER SIZE 2 | EA | 1 | 1 | Yes |
| 10 | FRONT END LOADER 2 1/2 CY | EA | 1 | 1 | Yes |
| 11 | VACUUM SWEEPER | EA | 1 | 1 | Yes |
| 12 | TOW SWEEPER | EA | 1 | 1 | Yes |
| 15 | EXCAVATOR | EA | 1 | 1 | Yes |
| 21 | BULLDOZER | EA | 1 | 1 | Yes |
| 25 | ALLOY BRAZING SILVER 1/16" | EA | 1 | 1 | Yes |
| 31 | ANTIFREEZE MIX 30GAL DR | EA | 3 | 3 | Yes |
| 51 | BLOCK ICE MACHINE | EA | 1 | 1 | Yes |
| 66 | CABLE ELECTRIC RUBBER | CL | 1 | 1 | Yes |
| 124 | ENTO-INSECTICIDE DIAZINON 48%EC 1GAL | GAL | 0 | 2 | Yes |
| 228 | LIGHTING SYS BARE BASE REMOTE 'RALS' | EA | 0 | 1 | Yes |
| 283 | PAINT TRAFFIC MARKING WHITE | EA | 3 | 6 | Yes |

LOGISTICS REPORT BY CONTINGENCY TASK

10 August 1988

| SIN NO. | RESOURCE DESCRIPTION | U/M | QUANTITY ON-HAND | QUANTITY ON-SITE | TASK NO. |
|---|---|---|---|---|---|
| 7 | DUMP TRUCK | EA | 1 | 1 | 1 |
| 9 | GRADER SIZE 2 | EA | 1 | 1 | 1 |
| 10 | FRONT END LOADER 2 1/2 CY | EA | 1 | 1 | 1 |
| 11 | VACUUM SWEEPER | EA | 1 | 1 | 1 |
| 12 | TOW SWEEPER | EA | 1 | 1 | 1 |
| 15 | EXCAVATOR | EA | 1 | 1 | 1 |
| 21 | BULLDOZER | EA | 1 | 1 | 1 |
| 204 | HARVEST EAGLE TENTS GPL | EA | 0 | 4 | 11 |
| 205 | HARVEST EAGLE TENTS GPM | EA | 37 | 200 | 11 |
| 235 | LUMBER 1X6X8' | EA | 257 | 450 | 11 |
| 236 | LUMBER 2"X4"X16' | EA | 124 | 249 | 11 |
| 237 | LUMBER 2"X6"X16' | EA | 110 | 120 | 11 |
| 238 | LUMBER 2"X6"X16' | EA | 23 | 80 | 11 |
| 239 | LUMBER 2X4X16 | EA | 257 | 300 | 11 |
| 240 | LUMBER 2X4X16' | EA | 998 | 1500 | 11 |
| 241 | LUMBER 2X6X16 | EA | 143 | 200 | 11 |
| 68 | CAMO NET BUNDLE | EA | 0 | 43 | 12 |
| 69 | CAMO NETTING (APPROX 10X14FT EA) | EA | 10 | 40 | 13 |
| 203 | HARVEST EAGLE SHOWER | EA | 0 | 1 | 24 |
| 296 | PLANS FOR LATRINES/URINAL/HANDWASH | EA | 1 | 1 | 24 |
| 297 | PLANS SHOWER/SHAVE | EA | 1 | 1 | 24 |
| 13 | TRUCK, WATER A-2 (2600 GAL) | EA | 1 | 1 | 30 |
| 17 | ONE HALF TON PICK-UP | EA | 1 | 1 | 30 |
| 77 | CHEM FEED PUMP PARTS | EA | 10 | 11 | 30 |
| 78 | CITRIC ACID 3/4 LB BOTTLES | EA | 50 | 50 | 30 |
| 105 | CITRIC ACID 100LB BAG | BG | 1 | 1 | 30 |
| 364 | ROWPU | EA | 1 | 3 | 30 |
| 365 | ROWPU GENERATORS 60KW | EA | 0 | 1 | 30 |
| 366 | ROWPU OVERPACK KIT 1000HRS | EA | 2 | 2 | 30 |
| 397 | STAVE TANK 3000GAL FOR ROWPU | EA | 2 | 3 | 30 |
| 436 | WATER PURAFICATION SYS "ROWPU" | EA | 0 | 1 | 30 |
| 437 | WATER STAVE TANKS 3000GAL | EA | 1 | 2 | 30 |
| 438 | WATER TEST KIT | EA | 0 | 1 | 30 |
| 448 | MISC PARTS FOR ROWPU | EA | 1 | 1 | 30 |
| 1 | WATER BUFFALO (600 GAL) | EA | 1 | 1 | 31 |
| 19 | FARM TRACTOR | EA | 1 | 1 | 31 |
| 292 | PIPE PVC 4" X 10' | EA | 34 | 40 | 31 |
| 293 | PIPING PCV 1 1/2"X20' VIC | EA | 0 | 35 | 31 |
| 430 | WATER (RAW) PIPE 3" | LF | 1130 | 2000 | 31 |
| 431 | WATER BLADDER 20000GAL | EA | 3 | 6 | 31 |
| 433 | WATER COOLERS 5GAL | EA | 24 | 20 | 31 |
| 434 | WATER PIPE 1 1/2" POTABLE | LF | 350 | 1000 | 31 |
| 435 | WATER PUMPS & PRESSURE REGULATOR | EA | 0 | 1 | 31 |
| 180 | GENERATOR 3KW PRIME BEEF | EA | 0 | 2 | 34 |

| SIN NO. | RESOURCE DESCRIPTION | U/M | QUANTITY ON-HAND | QUANTITY ON-SITE | TASK NO. |
|---|---|---|---|---|---|
| 146 | EXP GENERATOR 60KW | EA | 1 | 4 | 37 |
| 228 | LIGHTING SYS BARE BASE REMOTE 'RALS' | EA | 0 | 1 | 40 |
| 354 | REMOTE AREA LIGHTING SET | EA | 0 | 1 | 40 |
| 201 | HARVEST BARE AREA LIGHT (RALS) | EA | 0 | 2 | 41 |

PAGE 1 COMMANDER'S CRITICAL INVENTORY REPORT 10 August 1988

| SIN NO. | RESOURCE DESCRIPTION | U/M | QUANTITIES ON-HAND | ON-SITE | USED | CRIT INV. |
|---|---|---|---|---|---|---|
| 3 | FIRE TRUCK, P-19 | EA | 1 | 1 | 0 | Yes |
| 4 | CRASH TRUCK, P-15 | EA | 1 | 1 | 0 | Yes |
| 11 | VACUUM SWEEPER | EA | 1 | 1 | 0 | Yes |
| 12 | TOW SWEEPER | EA | 1 | 1 | 0 | Yes |
| 17 | ONE HALF TON PICK-UP | EA | 1 | 1 | 0 | Yes |
| 21 | BULLDOZER | EA | 1 | 1 | 0 | Yes |
| 105 | CITRIC ACID 100LB BAG | BG | 1 | 1 | 0 | Yes |
| 141 | EQUIP- OIL 30WT 55GAL DRUM | EA | 4 | 4 | 0 | Yes |
| 146 | EXP GENERATOR 60KW | EA | 1 | 4 | 3 | Yes |
| 161 | FIRE- HALON 1211 | LBS | 3000 | 3000 | 0 | Yes |
| 201 | HARVEST BARE AREA LIGHT (RALS) | EA | 0 | 2 | 2 | Yes |
| 206 | HIGH PRESSURE SWITCH | EA | 0 | 1 | 1 | Yes |
| 251 | MRE'S ADVON OPR SERVICES | CASE | 30 | 80 | 50 | Yes |
| 336 | RADIOS W/ CHARGERS | EA | 2 | 14 | 12 | Yes |
| 364 | ROWPU | EA | 1 | 3 | 2 | Yes |
| 365 | ROWPU GENERATORS 60KW | EA | 0 | 1 | 1 | Yes |
| 366 | ROWPU OVERPACK KIT 1000HRS | EA | 2 | 2 | 0 | Yes |
| 431 | WATER BLADDER 20000GAL | EA | 3 | 6 | 3 | Yes |
| 437 | WATER STAVE TANKS 3000GAL | EA | 1 | 2 | 1 | Yes |
| 449 | WATER | GAL | 1800 | 2000 | 200 | Yes |

NOTE: Quanity Used = Quanity On-Hand - Quanity On-Site.

## Appendix J: BBMIS Program Files

| FILE NAME | DESCRIPTION |
|---|---|
| **SYSTEM FILES:** | |
| BBMIS.BAT | Start-up Batch File |
| **DATA BASE FILES:** | |
| AFMGT.DBF | Airfield Information data base file |
| AFMGT.$BF | Airfield Information data base definition |
| AFMGT.$IF | Airfield Information input form |
| IAF_NO.NDX | Airfield Information data base index |
| AFMGT.SS3 | Airfield Information record processing file |
| LOGMGT.DBF | Logistics Information data base file |
| LOGMGT.$BF | Logistics Information data base definition |
| LOGMGT.$IF | Logistics Information input form |
| ILOG_NO.NDX | Logistics Information data base index |
| IL_EXT.NDX | Logistics Information data base index |
| LOGMGT.SS | Logistics Information select set |
| LOGMGT.SS2 | Logistics Information record processing file |
| MPBYTASK.DBF | Manpower Requirements data base file |
| MPBYTASK.$BF | Manpower Requirements data base definition |
| MPBYTASK.$IF | Manpower Requirements input form |
| MPBYTASK.$RF | Manpower Requirements report form |
| IMP_NO.NDX | Manpower Requirements data base index |
| IMP_EX_1.NDX | Manpower Requirements data base index |
| MPBYTASK.SS1 | Manpower Requirements record processing file |
| **WORD PROCESSING FILES:** | |
| HELP.WPF | Welcome Screen |
| EDIT.WPF | Data Base Editing Instructions |
| AFMGT1.RPT | Airfield Information Engineering Report |
| AFMGT2.RPT | Airfield Information Supplemental Report |
| AFMGT3.RPT | Airfield Information Logistics Report |
| LOGMGT.RPT | Logistics Information Commander's Report |
| LOGMGT1.RPT | Logistics Information Supplemental Report |
| LOGMGT2.RPT | Logistics Information Inventory Report |
| LOGMGT3.RPT | Logistics Information Vehicle Report |
| LOGMGT4.RPT | Logistics Information Airfield Report |
| LOGMGT5.RPT | Logistics Information Tasking Report |
| LOGMGT6.RPT | Logistics Information Critical Inventory Report |
| GEO1.WPF | Geographical Information - Regional |
| GEO2.WPF | Geographical Information - Regional |
| GEO3.WPF | Geographical Information - Regional |
| GEO4.WPF | Geographical Information - Regional |
| GEO5.WPF | Geographical Information - Regional |
| GEO6.WPF | Geographical Information - Regional |

| FILE NAME | DESCRIPTION |
|---|---|
| GEO7.WPF | Geographical Information - Regional |
| GEO8.WPF | Geographical Information - Regional |
| GEO9.WPF | Geographical Information - Regional |
| GEO10.WPF | Geographical Information - Regional |
| GEO11.WPF | Geographical Information - Regional |
| GEO12.WPF | Geographical Information - Regional |
| GEO13.WPF | Geographical Information - Regional |
| GEO14.WPF | Geographical Information - Regional |
| GEO15.WPF | Geographical Information - Host Country |
| GEO16.WPF | Geographical Information - Host Country |
| GEO17.WPF | Geographical Information - Host Country |
| GEO18.WPF | Geographical Information - Host Country |
| GEO19.WPF | Geographical Information - Host Country |
| MENUS | |
| MCM.MNU | Default MCM Menu (Main Menu) |
| DB.MNU | Default DBMS Menu (Main Menu) |
| WP.MNU | Default Word Processing Menu (Main Menu) |
| EDIT.MNU | Data Base Editing Instructions: Screen or Printer |
| B.MNU | Geographical Engineering or Supplemental Menu #1 |
| C.MNU | Geographical Alternate Airfield Selection Menu |
| D.MNU | Airfield Alternate Airfield Selection Menu #1 |
| E.MNU | Geographical Engineering or Supplemental Menu #2 |
| F.MNU | Airfield Information Main Menu |
| G.MNU | Geographical Information Main Manu |
| H.MNU | Geographical Regional Topics Menu #1 |
| I.MNU | Geographical Host Country Topics Menu |
| J.MNU | Geographical Primary or Alternate Airfield Menu |
| K.MNU | Geographical Regional Topics Menu #2 |
| L.MNU | Logistics Information Main Menu |
| M.MNU | Manpower Contingency Tasks Menu #1 |
| N.MNU | Manpower Contingency Tasks Menu #2 |
| O.MNU | Manpower Contingency Tasks Menu #3 |
| P.MNU | Manpower Task Selection Menu #1 |
| R.MNU | Printer or Screen Option Menu |
| T.MNU | Airfield Alternate Airfield Selection Menu #2 |
| U.MNU | Manpower Task Selection Menu #2 |
| V.MNU | Manpower Task Selection Menu #3 |
| X.MNU | Advanced Features Menu |
| GEO1.MNU | Geographical Screen or Printer Menu |
| GEO2.MNU | Geographical Screen or Printer Menu |
| GEO3.MNU | Geographical Screen or Printer Menu |
| GEO4.MNU | Geographical Screen or Printer Menu |
| GEO5.MNU | Geographical Screen or Printer Menu |
| GEO6.MNU | Geographical Screen or Printer Menu |
| GEO7.MNU | Geographical Screen or Printer Menu |

| FILE NAME | DESCRIPTION |
|---|---|
| GEO8.MNU | Geographical Screen or Printer Menu |
| GEO9.MNU | Geographical Screen or Printer Menu |
| GEO10.MNU | Geographical Screen or Printer Menu |
| GEO11.MNU | Geographical Screen or Printer Menu |
| GEO12.MNU | Geographical Screen or Printer Menu |
| GEO13.MNU | Geographical Screen or Printer Menu |
| GEO14.MNU | Geographical Screen or Printer Menu |
| GEO15.MNU | Geographical Screen or Printer Menu |
| GEO16.MNU | Geographical Screen or Printer Menu |
| GEO17.MNU | Geographical Screen or Printer Menu |
| GEO18.MNU | Geographical Screen or Printer Menu |
| GEO19.MNU | Geographical Screen or Printer Menu |
| MACROS | |
| ${4}.MCM | Start-up Macro |
| ${A}.MCM | Logistics Commander's Report Macro |
| ${B}.MCM | Logistics Supplemental Report Macro |
| ${C}.MCM | Logistics Inventory Report Macro |
| ${D}.MCM | Logistics Vehicle Report Macro |
| ${E}.MCM | Logistics Airfield Report Macro |
| ${F}.MCM | Logistics Tasking Report Macro |
| ${G}.MCM | Logistics Critical Inventory Report Macro |
| ${H}.MCM | Primary Airfield Engineering Report Macro |
| ${I}.MCM | Primary Airfield Supplemental Report Macro |
| ${J}.MCM | Primary Airfield Logistics Report Macro |
| ${K}.MCM | Airfield Manpower Tasking Report Macro |
| ${L}.MCM | Alternate Airfield Engineering Report Macro |
| ${M}.MCM | Alternate Airfield Supplemental Report Macro |
| ${N}.MCM | Manpower Task Selection Report Macro |

## Appendix K: BBMIS Data Base Fields And Files

LOGMGT.DBF FIELDS:

| FIELD NAME | | DESCRIPTION | SIZE |
|---|---|---|---|
| LOG_DESC | | Description of the resources | 4 |
| NOUN | | One or two word description | 12 |
| STK_NO | * | Stock number | 16 |
| SIN | * | Abbreviated stock number | 3 |
| U_M | | Unit of measurement | 4 |
| U_C | * | Unit cost | 8 |
| QTY_HAND | | Quantity on hand (available) | 5 |
| QTY_SITE | | Quantity on site (in use or consumed) | 5 |
| INV_STAT | * | Inventory status (OPR for the item) | 15 |
| BIN | * | Local storage location | 5 |
| INV_SOURCE | * | Source of the item (i.e., WRM) | 3 |
| CRIT_INV | * | Critical inventory (Y or N) | 1 |
| PLT_BOX | * | Pallet and box number | 10 |
| AF_SPT | * | Supports the airfield (Y or N) | 1 |
| TASK_SPT | * | Supports a contingency task (task no.) | 2 |
| VEH_SPT | | Registered vehicle (Y or N) | 1 |
| VEH_STAT | * | Status of vehicle (i.e., GOOD) | 6 |
| LOG_CMTS | * | Remarks | 25 |
| L_EXTRA_2 | | Quantity remaining (QTY_HAND-QTY_SITE) | 5 |
| LOG_NO | | Unused (indexed field) | 3 |
| INV_DATE | | Unused | 8 |
| M_P_NO | | Unused (indexed field) | 3 |
| L_EXTRA_3 | | Unused | 20 |

* Some or all of the data in this field is simulated.

AFMGT.DBF FIELDS:

| FIELD NAME | DESCRIPTION | SIZE |
|---|---|---|
| AF_NAME | Name of the airfield | 20 |
| COORDINATE | Coordinates of the airfield | 18 |
| AF_USER | Principal user(s) of the airfield | 21 |
| ELEVATION | Elevation of the airfield | 6 |
| VEGETATION | Local vegetation | 65 |
| RELIEF | Local aircraft hazards | 65 |
| CITY | Nearby city, population, and location | 65 |
| RW_NO1 | Runway number one designator | 1 |
| RW_NO2 * | Runway number two designator | 1 |
| RW_LENGTH1 | Length of runway number one | 6 |
| RW_LENGTH2* | Length of runway number two | 6 |
| RW_WIDTH1 * | Width of runway number one | 3 |
| RW_WIDTH2 * | Width of runway number two | 3 |
| RW_SHLDER1* | Type of shoulder on runway no. one | 12 |
| RW_SHLDER2* | Type of shoulder on runway no. two | 12 |
| RW_HEADNG1* | Compass heading of runway no. one | 7 |
| RW_HEADNG2* | Compass heading of runway no. two | 7 |
| RW_BASE1 * | Base material below runway no. one | 6 |
| RW_BASE2 * | Base material below runway no. two | 6 |
| PVMT1 | Type of pavement on runway no. one | 12 |
| PVMT2 * | Type of pavement on runway no. two | 12 |
| AF_PARTS * | Airfield components, First line | 78 |
| AF_PARTS2 * | Airfield components, Second line | 78 |
| AF_PARTS3 * | Airfield components, Third line | 78 |
| AF_CMTS * | First line of comments | 78 |
| AF_CMTS2 * | Second line of comments | 78 |
| AF_CMTS3 * | Third line of comments | 78 |
| AF_CMTS4 * | Forth line of comments | 78 |
| AF_EXTRA2 | Name of country | 15 |
| AF_NO | Unused (indexed field) | 3 |
| AF_EXTRA1 | Unused (indexed field) | 8 |
| AF_EXTRA3 | Unused (indexed field) | 20 |

* Some or all of the data in this field is simulated.

MPBYTASK.DBF FIELDS:

| FIELD NAME | DESCRIPTION | SIZE |
|---|---|---|
| MP_NO | Task index number (indexed field) | 43 |
| FAC_NAME | Title of task | 80 |
| MP_DESC1 | Description of task, First line | 80 |
| MP_DESC2 | Description of task, Second line | 80 |
| MP_DESC3 | Description of task, Third line | 80 |
| MP_DESC4 | Description of task, Forth line | 80 |
| MP_DESC5 | Description of task, Fifth line | 80 |
| MP_DESC6 | Description of task, Sixth line | 80 |
| MP_DESC7 | Description of task, Seventh line | 80 |
| MP_DESC8 | Description of task, Eighth line | 80 |
| MP_DESC9 | Description of task, Ninth line | 80 |
| CREW1 | Description of sub-task 1 | 36 |
| CREW2 | Description of sub-task 2 | 36 |
| CREW3 | Description of sub-task 3 | 36 |
| CREW4 | Description of sub-task 4 | 36 |
| CREW5 | Description of sub-task 5 | 36 |
| CREW6 | Description of sub-task 6 | 36 |
| CREW7 | Description of sub-task 7 | 36 |
| CREW1_H | Crew size (Horizontal), Sub-task 1 | 3 |
| CREW2_H | Crew size (Horizontal), Sub-task 2 | 3 |
| CREW3_H | Crew size (Horizontal), Sub-task 3 | 3 |
| CREW4_H | Crew size (Horizontal), Sub-task 4 | 3 |
| CREW5_H | Crew size (Horizontal), Sub-task 5 | 3 |
| CREW6_H | Crew size (Horizontal), Sub-task 6 | 3 |
| CREW7_H | Crew size (Horizontal), Sub-task 7 | 3 |
| CREW1_V | Crew size (Vertical), Sub-task 1 | 3 |
| CREW2_V | Crew size (Vertical), Sub-task 2 | 3 |
| CREW3_V | Crew size (Vertical), Sub-task 3 | 3 |
| CREW4_V | Crew size (Vertical), Sub-task 4 | 3 |
| CREW5_V | Crew size (Vertical), Sub-task 5 | 3 |
| CREW6_V | Crew size (Vertical), Sub-task 6 | 3 |
| CREW7_V | Crew size (Vertical), Sub-task 7 | 3 |
| CREW1_G | Crew size (General), Sub-task 1 | 3 |
| CREW2_G | Crew size (General), Sub-task 2 | 3 |
| CREW3_G | Crew size (General), Sub-task 3 | 3 |
| CREW4_G | Crew size (General), Sub-task 4 | 3 |
| CREW5_G | Crew size (General), Sub-task 5 | 3 |
| CREW6_G | Crew size (General), Sub-task 6 | 3 |
| CREW7_G | Crew size (General), Sub-task 7 | 3 |

MPBYTASK.DBF FIELDS (cont.):

| FIELD NAME | DESCRIPTION | SIZE |
|---|---|---|
| CREWH_TOT | Total crew size for Horizontal work | 3 |
| CREWV_TOT | Total crew size for Vertical work | 3 |
| CREWG_TOT | Total crew size for General work | 3 |
| CREW_CMTS | Additional comments on crew size | 80 |
| MAN1_H | Man-hours (Horizontal), Sub-task 1 | 4 |
| MAN2_H | Man-hours (Horizontal), Sub-task 2 | 4 |
| MAN3_H | Man-hours (Horizontal), Sub-task 3 | 4 |
| MAN4_H | Man-hours (Horizontal), Sub-task 4 | 4 |
| MAN5_H | Man-hours (Horizontal), Sub-task 5 | 4 |
| MAN6_H | Man-hours (Horizontal), Sub-task 6 | 4 |
| MAN7_H | Man-hours (Horizontal), Sub-task 7 | 4 |
| MAN1_V | Man-hours (Vertical), Sub-task 1 | 4 |
| MAN2_V | Man-hours (Vertical), Sub-task 2 | 4 |
| MAN3_V | Man-hours (Vertical), Sub-task 3 | 4 |
| MAN4_V | Man-hours (Vertical), Sub-task 4 | 4 |
| MAN5_V | Man-hours (Vertical), Sub-task 5 | 4 |
| MAN6_V | Man-hours (Vertical), Sub-task 6 | 4 |
| MAN7_V | Man-hours (Vertical), Sub-task 7 | 4 |
| MAN1_G | Man-hours (General), Sub-task 1 | 4 |
| MAN2_G | Man-hours (General), Sub-task 2 | 4 |
| MAN3_G | Man-hours (General), Sub-task 3 | 4 |
| MAN4_G | Man-hours (General), Sub-task 4 | 4 |
| MAN5_G | Man-hours (General), Sub-task 5 | 4 |
| MAN6_G | Man-hours (General), Sub-task 6 | 4 |
| MAN7_G | Man-hours (General), Sub-task 7 | 4 |
| MAN1_T | Man-hours (Total), Sub-task 1 | 4 |
| MAN2_T | Man-hours (Total), Sub-task 2 | 4 |
| MAN3_T | Man-hours (Total), Sub-task 3 | 4 |
| MAN4_T | Man-hours (Total), Sub-task 4 | 4 |
| MAN5_T | Man-hours (Total), Sub-task 5 | 4 |
| MAN6_T | Man-hours (Total), Sub-task 6 | 4 |
| MAN7_T | Man-hours (Total), Sub-task 7 | 4 |
| MANH_TOT | Total Horizontal man-hours | 4 |
| MANV_TOT | Total Vertical man-hours | 4 |
| MANG_TOT | Total General man-hours | 4 |
| MANT_TOT | Grand total of man-hours | 4 |
| MP_CMTS1 | Remarks, Line 1 | 80 |
| MP_CMTS2 | Remarks, Line 2 | 80 |
| MP_CMTS3 | Remarks, Line 3 | 80 |

MPBYTASK.DBF FIELDS (cont.):

| FIELD NAME | DESCRIPTION | SIZE |
|---|---|---|
| MP_CMTS4 | Remarks, Line 4 | 80 |
| MP_CMTS5 | Remarks, Line 5 | 80 |
| MP_CMTS6 | Remarks, Line 6 | 80 |
| MP_CMTS7 | Remarks, Line 7 | 80 |
| MP_CMTS8 | Remarks, Line 8 | 80 |
| MP_CMTS9 | Remarks, Line 9 | 80 |
| MP_CMTS10 | Remarks, Line 10 | 80 |
| SOURCE1 | Manpower requirements source, Line 1 | 80 |
| SOURCE2 | Manpower requirements source, Line 2 | 80 |
| SOURCE3 | Manpower requirements source, Line 3 | 80 |
| SOURCE4 | Manpower requirements source, Line 4 | 80 |
| SOURCE5 | Manpower requirements source, Line 5 | 80 |
| SOURCE6 | Manpower requirements source, Line 6 | 80 |
| SOURCE7 | Manpower requirements source, Line 7 | 80 |
| SOURCE8 | Manpower requirements source, Line 8 | 80 |
| SOURCE9 | Manpower requirements source, Line 9 | 80 |
| SOURCE10 | Manpower requirements source, Line 10 | 80 |
| SOURCE11 | Manpower requirements source, Line 11 | 80 |
| SOURCE12 | Manpower requirements source, Line 12 | 80 |
| SOURCE13 | Manpower requirements source, Line 13 | 80 |
| SOURCE14 | Manpower requirements source, Line 14 | 80 |

**GEOGRAPHICAL FILES:**

| FILE NAME | DESCRIPTION |
|---|---|
| GEO1.WPF | Regional Religious Background Information |
| GEO2.WPF | Regional Religious Diet Restrictions |
| GEO3.WPF | Regional Religious Courtesies |
| GEO4.WPF | Regional Business and Social Customs Background |
| GEO5.WPF | Regional Business Courtesies |
| GEO6.WPF | Regional Gestures |
| GEO7.WPF | Regional Clothing |
| GEO8.WPF | Regional Health Factors - Acclimation |
| GEO9.WPF | Regional Health Factors - Diseases and Illness |
| GEO10.WPF | Regional Personal Hygiene and Sanitation |
| GEO11.WPF | Regional Building Materials |
| GEO12.WPF | Regional Equipment Operation and Maintenance |
| GEO13.WPF | Regional Labor, Fire Fighting, Power Production |
| GEO14.WPF | Regional Camp Siting |
| GEO15.WPF | Country Geography and Roads |
| GEO16.WPF | Country Population, Sanitation, Health Hazards |
| GEO17.WPF | Country Local Airfields |
| GEO18.WPF | Country Local Climate |
| GEO19.WPF | Country Briefing Notes |

## Bibliography


1. Aular, Raimundo J., et al. The Evolution and Role of the Bare Base Concept and Equipment in a Modern Tactical Air Mobility Environment. MS thesis, AFIT/SLGR/11-74B. School of Systems and Logistics, Air Force Institute of Technology (AU), Wright-Patterson AFB OH, August 1974 (AD-785463).

2. "Bare-Base: A New Frontier-AFESC," TIG Brief 6, XXXVI: 20-21 (April 1984).

3. Bell, Jack. "Feds Opt For Zenith Laptops," Personal Computing, 11: 33 (November 1987).

4. Bray, Michael W., Prime BEEF Logistics NCOIC. Personal interview. 2750th Civil Engineering Squadron, Wright-Patterson AFB OH, 2 August 1988.

5. Briesmaster, Captain Harry, III. An Examination of the Air Force's Bare-Base Design in Terms of the Impact on the Air Base Survivability Using Computer Modeling Evaluation. MS Thesis, AFIT/GEM/DET/86S-5. School of Systems and Logistics, Air Force Institute of Technology (AU). Wright-Patterson AFB OH, September 1986 (AD-B107649).

6. Callahan, Ed PH.D. "User-Friendly Software: The Role of the User," Proceedings of the Interservice/Industry Training Equipment Conference (5th). 312-319. Alexandria VA: Essex Corporation, 16 November 1983.

7. Carson, Capt Michael G., Bright Star '87 Support Base Commander. Telephone interview. McDill AFB FL, 26 January 1988.

8. Carson, Capt William J. and Capt Bruce R. Nadler. Consolidation of Contingency Data and its use in Computer Graphics to Plan Bare Base Facility Construction at a Forward Operating Location. MS Thesis, LSSR 41-83. School of Systems and Logistics, Air Force Institute of Technology (AU). Wright-Patterson AFB OH, September 1983 (AD-A134432).

9. Cathey, Carl H., Jr. "Let's Go Bare Base," Student Essay from U.S. Army War College, Carlisle Barracks, Pennsylvania, 9 March 1970.

10. Christensen, Lt Col Bruce P., Assistant Professor of Logistics Management. Personal interview. School of Systems and Logistics, Air Force Institute of Technology, Wright-Patterson AFB OH, 12 April 1988.

11. Cooke, Brian C., Engineering Assistant. Personal interview. 2750th Civil Engineering Squadron, Wright-Patterson AFB OH, 2 August 1988.

12. Davis, Capt Roger L., Assistant Professor of Systems Management. Personal interview. School of Systems and Logistics, Air Force Institute of Technology, Wright-Patterson AFB OH, 15 April 1988.

13. Dickerson, Gary W. and James C. Wetherbe. The Management Information Systems. New York: McGraw-Hill Book Company, 1985.

14. Doggett, Michael. "TENT CITY" Version 3.08.21. Computer Program for the WANG computer. Copy supplied to writer by Maj James Holt, AFIT/LSM, Wright-Patterson AFB OH, January 1988.

15. Draper, Stephen W. and Donald A. Norman. Software Engineering for User Interfaces. Grant number N00014-79-C-0323. La Jolla CA: Center for Human Information Processing, Institute for Cognitive Science, University of California, San Diego, January 1984 (AD-A138937).

16. Ehnert, Maj George E., Capt Ronald V. Descheneaux, and Capt Terrence E. Kolet. "Proud Phantom--TAC Tackles the Sahara," Air Force Engineering and Services Quarterly, 22: 4-8 (Summer 1981).

17. Ellis, Maj Gen George E. "Commitment to Excellence," The Military Engineer, 512: 18-21 (January/February 1987).

18. Fox, Robert W., Readiness Operations Planner. Telephone interview. HQ SAC/DEER, Offutt AFB NE, 8 February 1988.

19. "Getting Started" and Manual Supplement, Enable Version 2. Zenith™ Data Systems Corporation, St. Joseph, Michigan.

20. Green, John H., Chief of War Readiness Branch. Telephone interview. HQ TAC/LGXW, Langley AFB VA, 13 May 1988.

21. Hanson, Lt Col Thomas M., Director Management and Resources, DCS Engineering and Services. Telephone interview. HQ SAC/DER, Offutt AFB NE, 27 January 1988.

22. Hanson, Maj Thomas M., Bright Star '85 Base Civil Engineer. Personal Correspondence. HQ SAC/DER, Offutt AFB NE, 14 July - 28 August 1985.

23. Holt, Lt Col James R., Assistant Professor of Engineering Management. Personal interview. School of Systems and Logistics, Air Force Institute of Technology, Wright-Patterson AFB OH, 14 April 1988.

24. Lindsey, Lt Col James T. Jr., Head, Department of Communication and Organizational Sciences. Personal interview. School of Systems and Logistics, Air Force Institute of Technology, Wright-Patterson AFB OH, 7 April 1988.

25. Martin, Capt Chal A. An Information Manual to Support Base Engineering Emergency Force (Prime BEEF) Team Deployments to Egypt or the Arabian Peninsula. MS Thesis, AFIT/GEM LSSR/32-83. School of Systems and Logistics, Air Force Institute of Technology (AU), Wright-Patterson AFB OH, September 1983 (AD-A134403).

26. McNickle, Major Paul J. Essential Facilities For Tactical Aircraft beddown At Forward Bases. Student Report 83-1630. Air Command and Staff College (AU), Maxwell AFB AL, April 1983 (AD-B074720).

27. Mills, Capt James R., Chief of Readiness. Telephone interview. HQ SAC/DEER, Offutt AFB NE, 8 February 1988.

28. Moore, Lt Col Richard I., Assistant Professor of Logistics Management. Personal interview. School of Systems and Logistics, Air Force Institute of Technology, Wright-Patterson AFB OH, 14 April 1988.

29. Parten, Mildred PH.D. Surveys, Polls, and Samples: Practical Procedures. New York: Cooper Square Publishing, Inc., 1966.

30. Peschke, Lt Col Richard E., Head, Department of Quantitative Management. Personal interview. School of Systems and Logistics, Air Force Institute of Technology, Wright-Patterson AFB OH, 5 May 1988.

31. Petryszyn, Capt Stephen., Bright Star '87 Base Civil Engineer. Telephone interview. Myrtle Beach AFB SC, 29 January 1988.

32. Polasic, Capt Kenneth W., Co-Course Director for Air Base Combat Engineering. Personal interview. School of Civil Engineering and Services, Air Force Institute of Technology, Wright-Patterson AFB OH, 3 August 1988.

33. Rickard, Maj Douglas P., Director of Logistics Plans. Telephone interview. Air Force Logistics Command/LGX, Gunter AFB AL, 12 May 1988.

34. _____. Harvest Eagle Inventory Management System, User's Guide. Air Force Logistics Maintenance Center, Gunter AFS AL, March 1988 (LX851221-2).

35. Small Computer Technical Center, Tactical Air Command. "Updates." News Letter. Langley AFB VA, March 1988.

36. Smith, Capt James W., Assistant Professor of Base Level Maintenance Management. Personal interview. School of Systems and Logistics, Air Force Institute of Technology, Wright-Patterson AFB OH, 8 April 1988.

37. Smith, Sidney L. and Jane N. Mosier. Guidelines for Designing User Interface Software. Contract F19628-84-C-0001. Bedford MA: The Mitre Corporation, 1 August 1986 (AD-A177198).

38. Spezzano, Charles, PH.D. Using Enable™ (Second Edition). Carmel: Que™ Corporation, 1987.

39. Stoddard, Capt Albert T. III., Instructor, Airfield Pavement Engineering, ENG 550. Personal interview. School of Civil Engineering and Services, Air Force Institute of Technology, Wright-Patterson AFB OH, 3 August 1988.

40. Tucker, 1st Lt Douglas K. and Capt Danny E. Van Dalsen. A Decision Support System for Bare-Base Planners. MS Thesis, AFIT/GEM/LSM/84S-19. School of System and Logistics, Air Force Institute of Technology (AU). Wright-Patterson AFB OH, September 1984 (AD-A146959).

41. U.S. Air Force Engineering and Services Center. Bare Base Conceptual Planning Guide. AFESC/DEO, Tyndall AFB FL, 1985.

42. U.S. Department of the Air Force.. AFLMC Active, Pending And Consulting/Support Project Summaries. Alabama: Gunter AFS, June 1987.

43. _____. Air Force Civil Engineering Prime Base Engineer Emergency Force (BEEF) Program. AFR 93-3. Washington: HQ USAF, 20 November 1987.

44. _____. Base Recovery Planning. AFR 93-2. Washington: HQ USAF, 11 December 1979.

45. _____. "End-of-Deployment Report, Gallant Eagle '86," 836th Civil Engineering Squadron Trip Report, Davis-Monthan AFB AZ, 1 November 1986.

46. _____. "Exercise Bright Star 1985," Headquarters Strategic Air Command/DER Trip Report, Offutt AFB NE, undated.

47. _____. "Exercise Bright Star 1987," 354th Civil Engineering Squadron Trip Report, Myrtle Beach AFB SC, 22 January 1988.

48. _____. Project 3782-Bare Base Mobility. Langley AFB VA: Tactical Air Command, 25 September 1973.

49. _____. Troop Construction and Engineering Support of the Air Force Overseas. AFR 93-10. Washington: HQ USAF, 15 May 1979.

50. Waggoner, Capt L. Dean and Lt M. Allen Moe. A History of Air Force Civil Engineering Wartime and Contingency Problems from 1941 to the Present. MS Thesis, GEM/LS/85S-23. School of Systems and Logistics, Air Force Institute of Technology (AU), Wright-Patterson AFB OH, September 1985 (AD-A161142).

51. Wheeler, Capt Jon A., Co-Course Director for Air Base Combat Engineering, ENG 485. Personal interview. School of Civil Engineering and Services, Air Force Institute of Technology, Wright-Patterson AFB OH, 5 April 1988.

52. Wilson, Capt Francis D., 9th Air Force Bare Base Exercise Planner. Telephone interview. HQ AF CENTAF/LGXE, Shaw AFB SC, 11 February 1988.

53. Windham, Lt Col Cliffton T. and Joseph H. Smith. "Bare Base: A New Frontier," Air Force Engineering and Services Quarterly, 24: 24-26 (Winter 1983).

54. Woodruff, Robin M. "Bare Base: Will It Work?" Student Research Report from Air War College, Maxwell AFB AL, April 1972.

55. Z-180 PC Series Computer Owner's Manual. Zenith™ Data Systems Corporation, St. Joseph, Michigan.

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The bare base deployment scenario contains some of the most challenging tasks facing Air Force Civil Engineering today--yet the essential information needed to accomplish this mission is difficult or impossible to manage efficiently during the limited time between notification and the end of the initial beddown stage. The purpose of this research was to determine the feasibility of developing a microcomputer based management information system (MIS) designed for use by the Civil Engineering (CE) commander during the initial stages of a bare base scenario.

Nineteen categories of unclassified information needed by the bare base CE commander were identified from governing regulations, exercise documents, and interviews with CE commanders and MAJCOM planners of past bare base exercises. These categories were evaluated against automation constraints (both hardware and software) to select the software best suited to synthesize four of the categories into a prototype field MIS.

The Software Groups's Enable™ Version 2.0 was used to automate the following information categories: Logistics Information, Airfield Information, Geographical Information, and Manpower Requirements By Task. The resulting package, Bare Base Management Information System (BBMIS), is an easy-to-use, integrated program designed to insure bare base CE commanders have prompt, concise, and accurate management support information at their fingertips. With a small amount of training and no knowledge of Enable, the user can perform all of BBMIS's basic operations. The program was designed for the Zenith™ Z-184 laptop personal computer for ease of transportation and use while in the field.

Although other information categories identified by the experts must be incorporated into the BBMIS program to supply all the commander's information needs, the prototype developed in this research demonstrates that a deployable management information system, based on validated requirements, is both conceptually sound and possible with current technology.